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(12) **United States Patent**
Mistkawi et al.

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(45) **Date of Patent: Aug. 17, 2021**

(54) **FINGER WEARABLE SCANNER AND RELATED METHODS**

(71) Applicant: **Datalogic USA, Inc.**, Eugene, OR (US)

(72) Inventors: **Joseph Mistkawi**, Tigard, OR (US); **Robert Rudeen**, Monroe, CT (US); **Mattia Gaglione**, Lippo di Calderara di Reno (IT)

(73) Assignee: **Datalogic USA, Inc.**, Eugene, OR (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **16/802,450**

(22) Filed: **Feb. 26, 2020**

(65) **Prior Publication Data**

US 2020/0272801 A1 Aug. 27, 2020

Related U.S. Application Data

(60) Provisional application No. 62/810,899, filed on Feb. 26, 2019.

(51) **Int. Cl.**
G06K 7/10 (2006.01)
G06K 7/14 (2006.01)

(52) **U.S. Cl.**
CPC . ***G06K 7/1408*** (2013.01); *G06K 2007/10524* (2013.01)

(58) **Field of Classification Search**
CPC G06K 2007/10524; G06K 7/10891; G06K 7/1408
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,212,372	A	5/1993	Quick et al.	
5,329,106	A *	7/1994	Hone	G06K 7/10891 235/462.44
5,410,140	A	4/1995	Bard et al.	
5,578,810	A	11/1996	Bard et al.	
5,610,386	A	3/1997	Ball et al.	
6,003,774	A	12/1999	Bard et al.	
6,375,079	B1	4/2002	Swartz	
6,634,558	B1	10/2003	Patel et al.	
6,832,724	B2	12/2004	Yavid et al.	
7,764,488	B2	7/2010	Calvarese	
7,991,654	B1 *	8/2011	Sacks	G06F 3/0346 705/28
9,679,180	B2	6/2017	Lim et al.	

(Continued)

FOREIGN PATENT DOCUMENTS

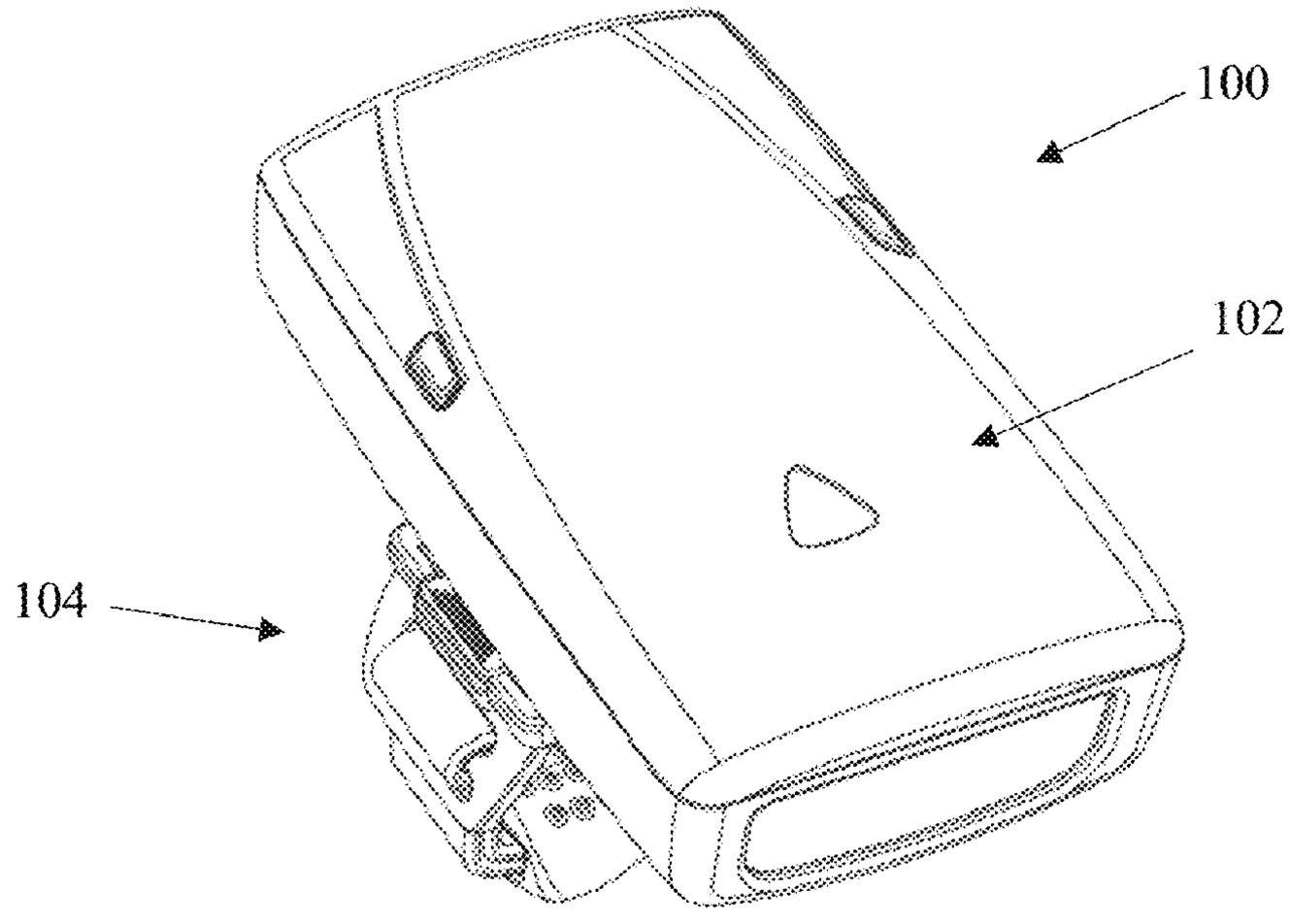
DE	102018105578	A1	9/2019
WO	2019126236	A1	6/2019

Primary Examiner — Thien M Le
(74) *Attorney, Agent, or Firm* — Stoel Rives LLP

(57) **ABSTRACT**

A finger wearable scanner includes a scanner unit detachably coupled to a trigger unit. The scanner unit includes an upper enclosure and a lower enclosure that are detachable from each other, and a scan engine mount assembly and a scan engine mounted thereto that is configured to read and decode an identifier on an object. The scan engine assembly includes mounting locations that engage with fasteners to mount be mounted to both the upper enclosure and the lower enclosure. The trigger assembly is configured to be attached to and detached from the wearable scanner, and to be worn by a body part of a user. The trigger assembly includes a trigger switch to control operational functions of the wearable scanner responsive to an input from the user.

20 Claims, 26 Drawing Sheets



(56) **References Cited**

U.S. PATENT DOCUMENTS

10,135,213	B2	11/2018	Brunnbauer et al.	
10,466,782	B2	11/2019	Brunnbauer et al.	
10,537,143	B2	1/2020	Guenther et al.	
2011/0175705	A1*	7/2011	Bellows	H04B 17/103 340/10.1
2014/0249944	A1*	9/2014	Hicks	G06Q 30/0281 705/17
2015/0278570	A1*	10/2015	Van Horn	H01Q 1/52 235/472.01
2016/0161301	A1*	6/2016	Guenther	A61B 5/6806 702/150
2018/0146720	A1	5/2018	Sittig et al.	
2019/0196535	A1	6/2019	Paufler	
2019/0197273	A1	6/2019	Mazzone	
2019/0364996	A1*	12/2019	Kettner	A41D 19/0024

* cited by examiner

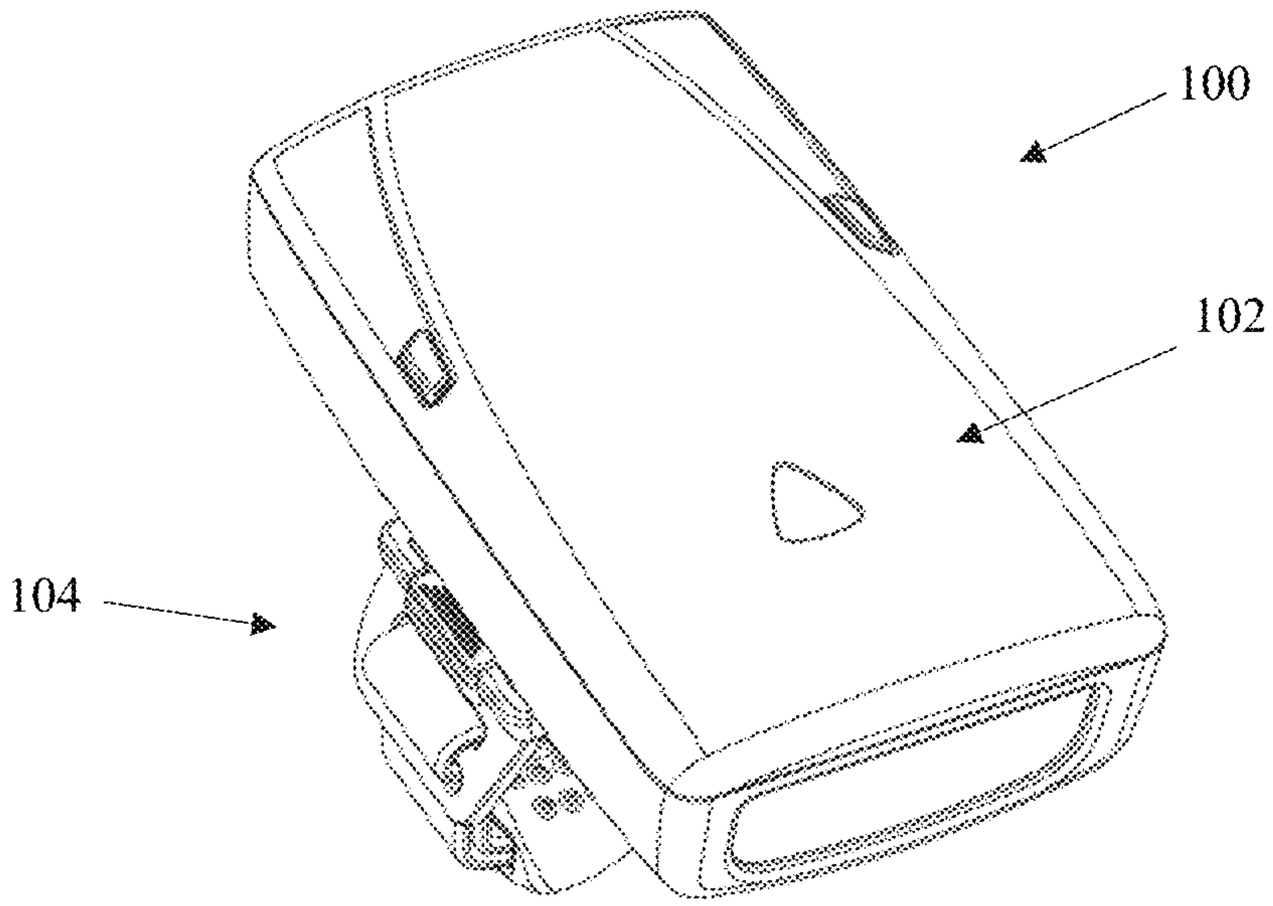


FIG. 1A

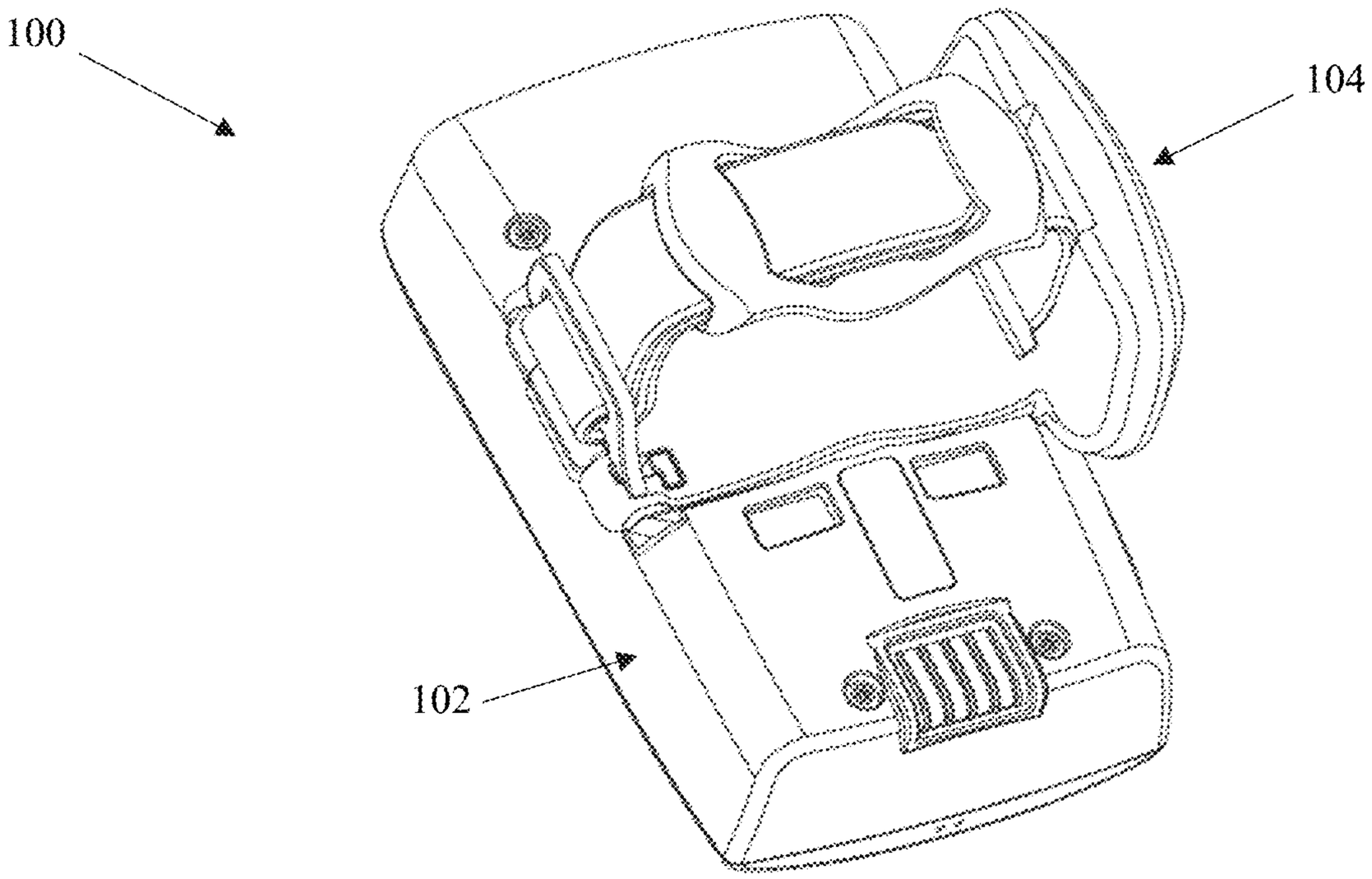


FIG. 1B

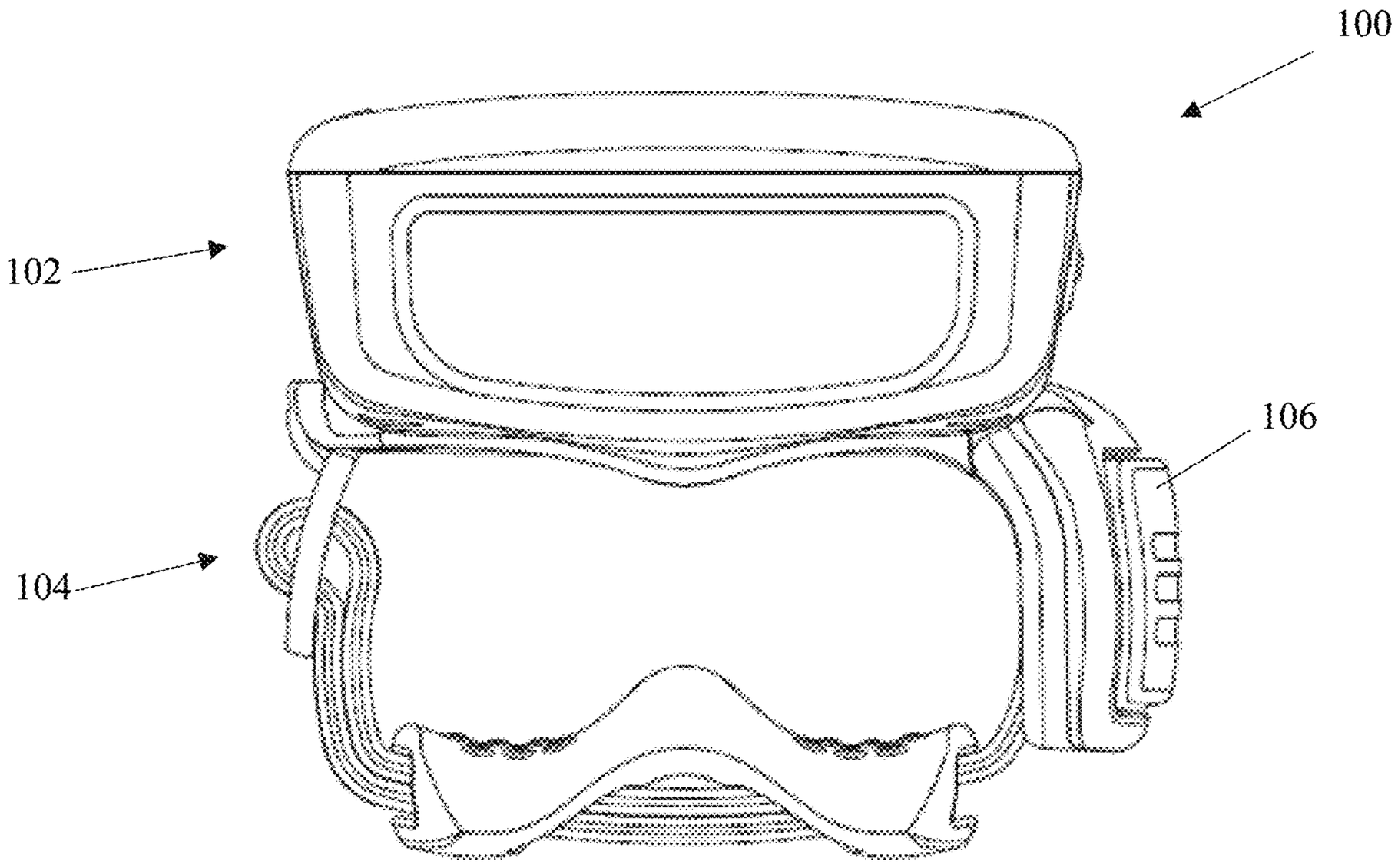


FIG. 1C

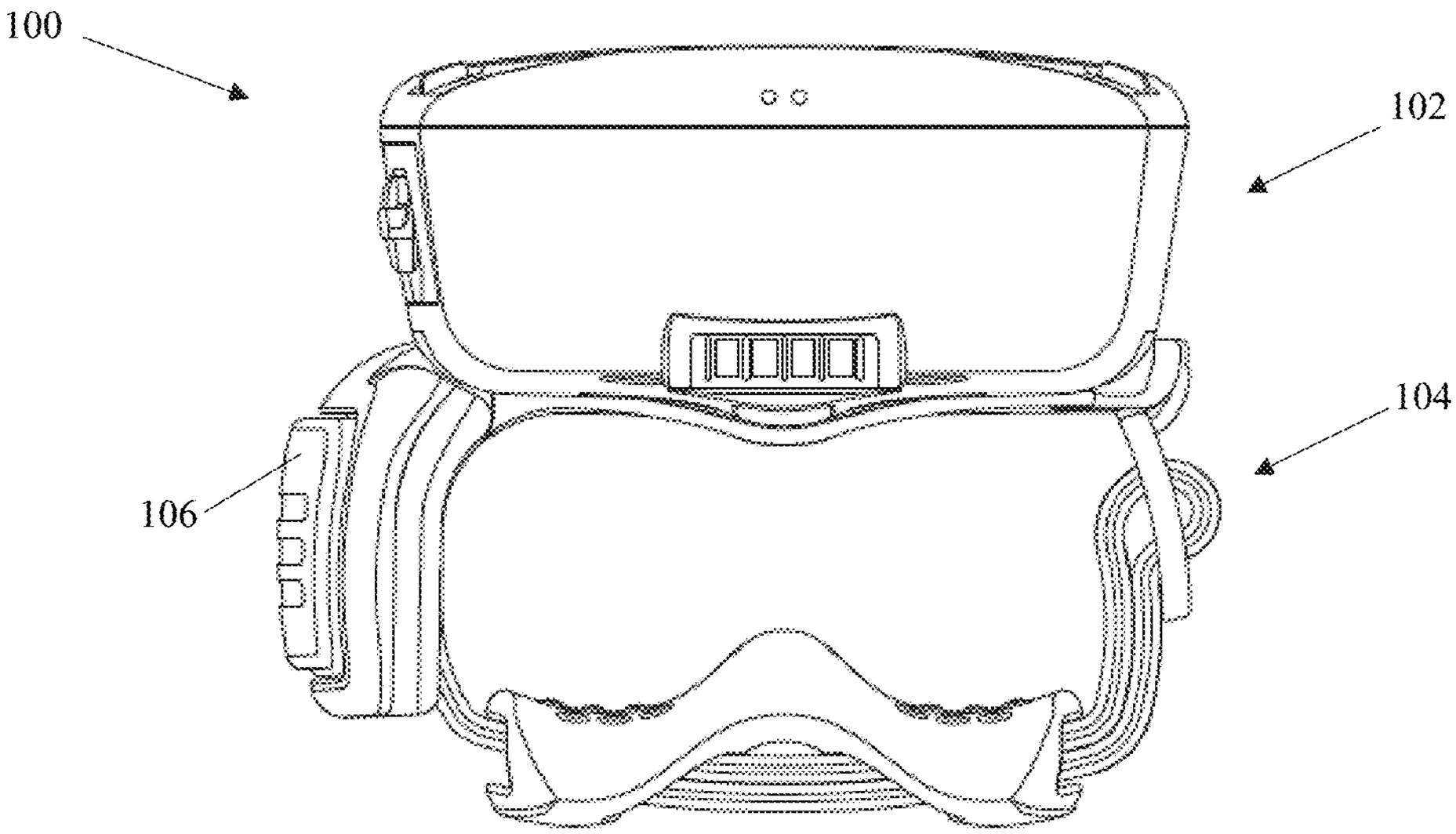


FIG. 1D

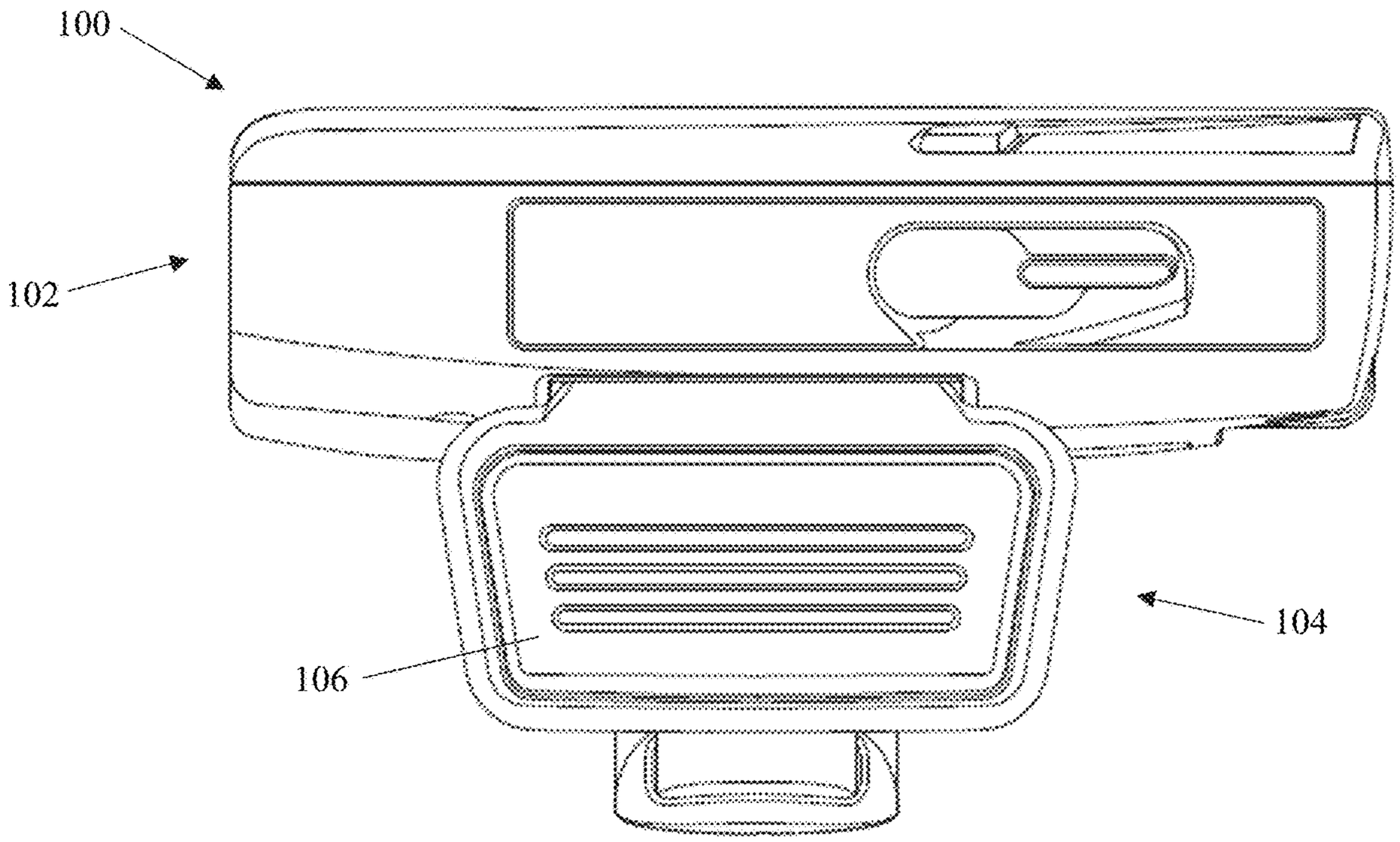


FIG. 1E

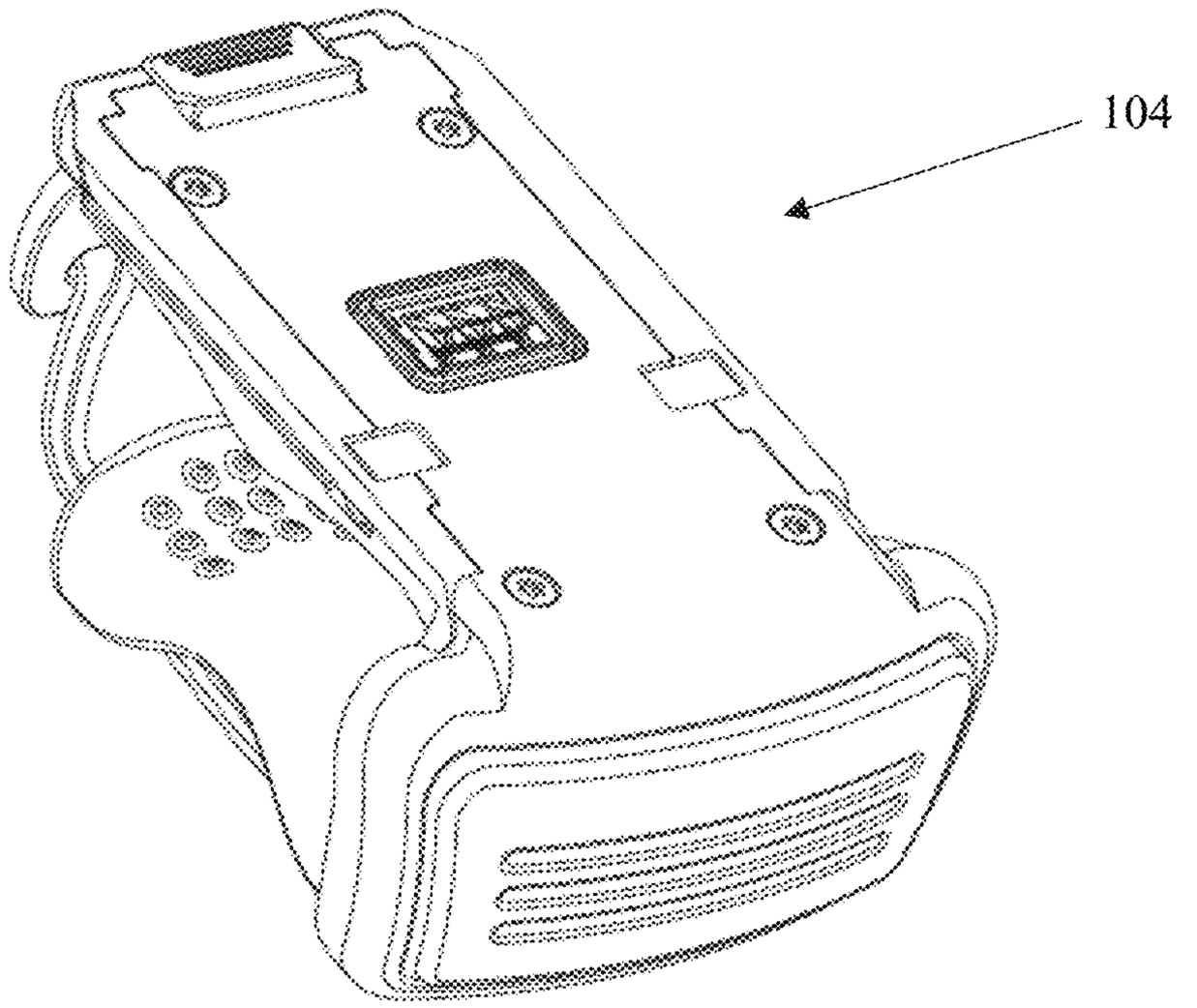


FIG. 1F

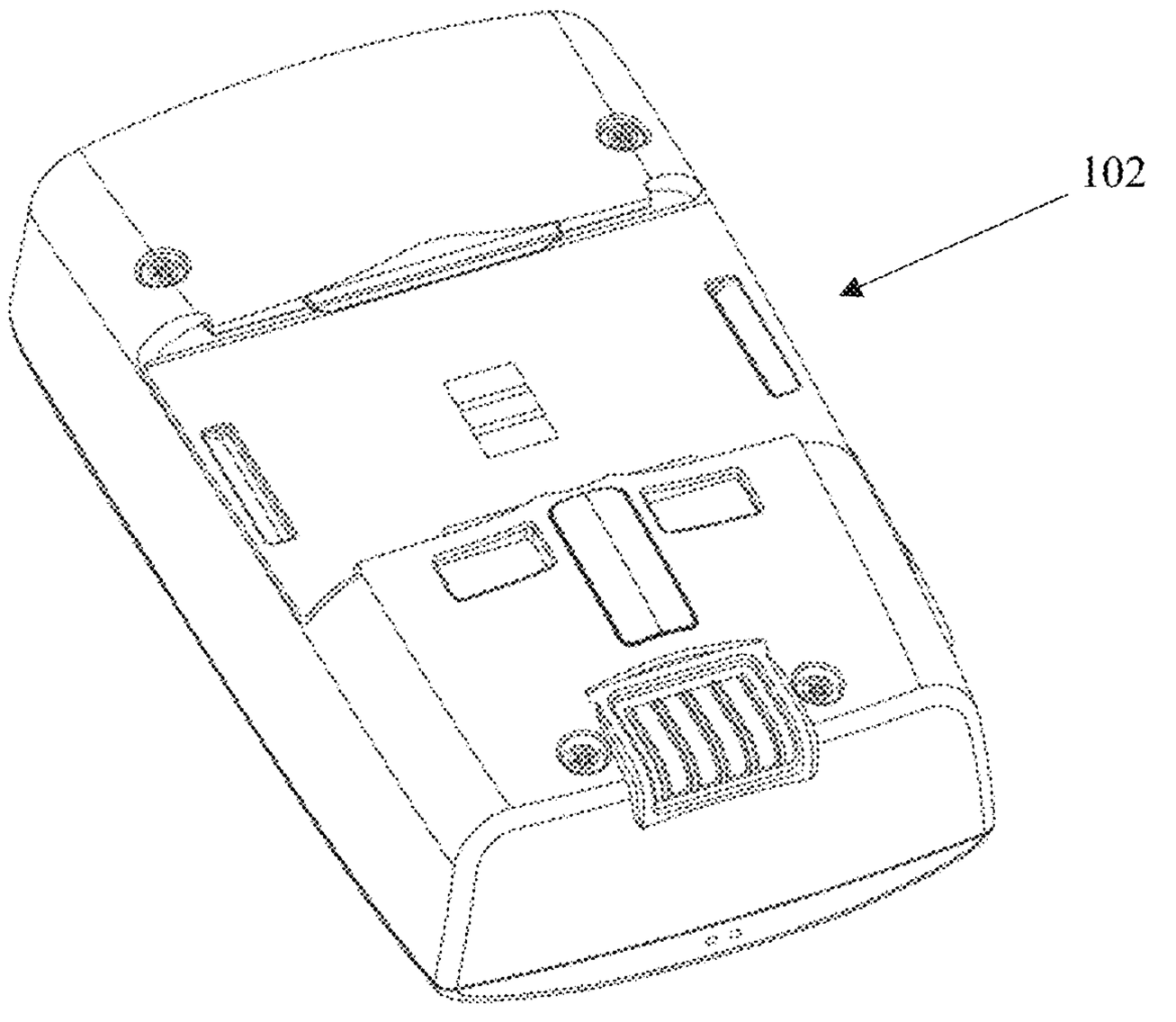


FIG. 1G

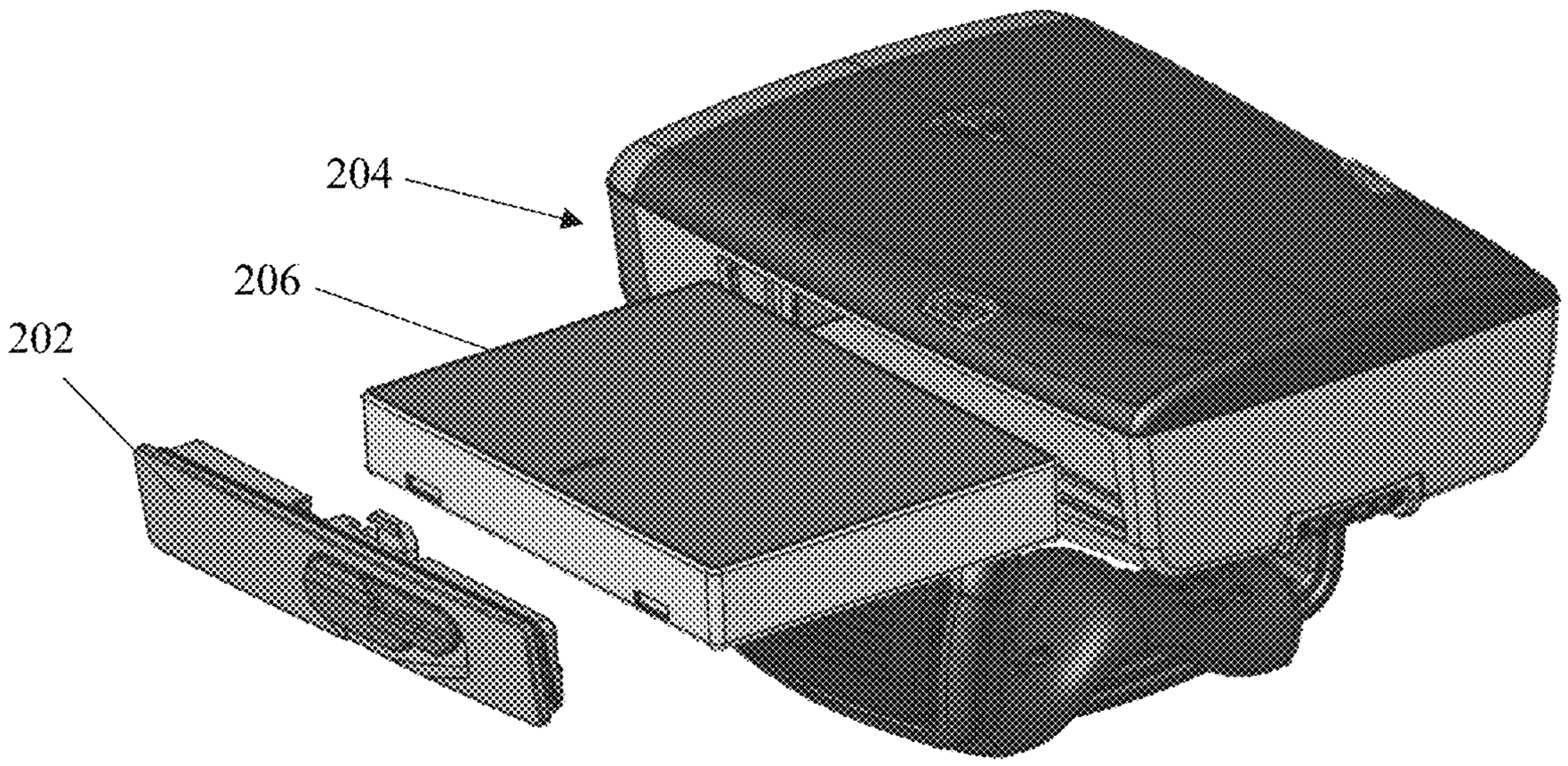


FIG. 2A

FIG. 2B

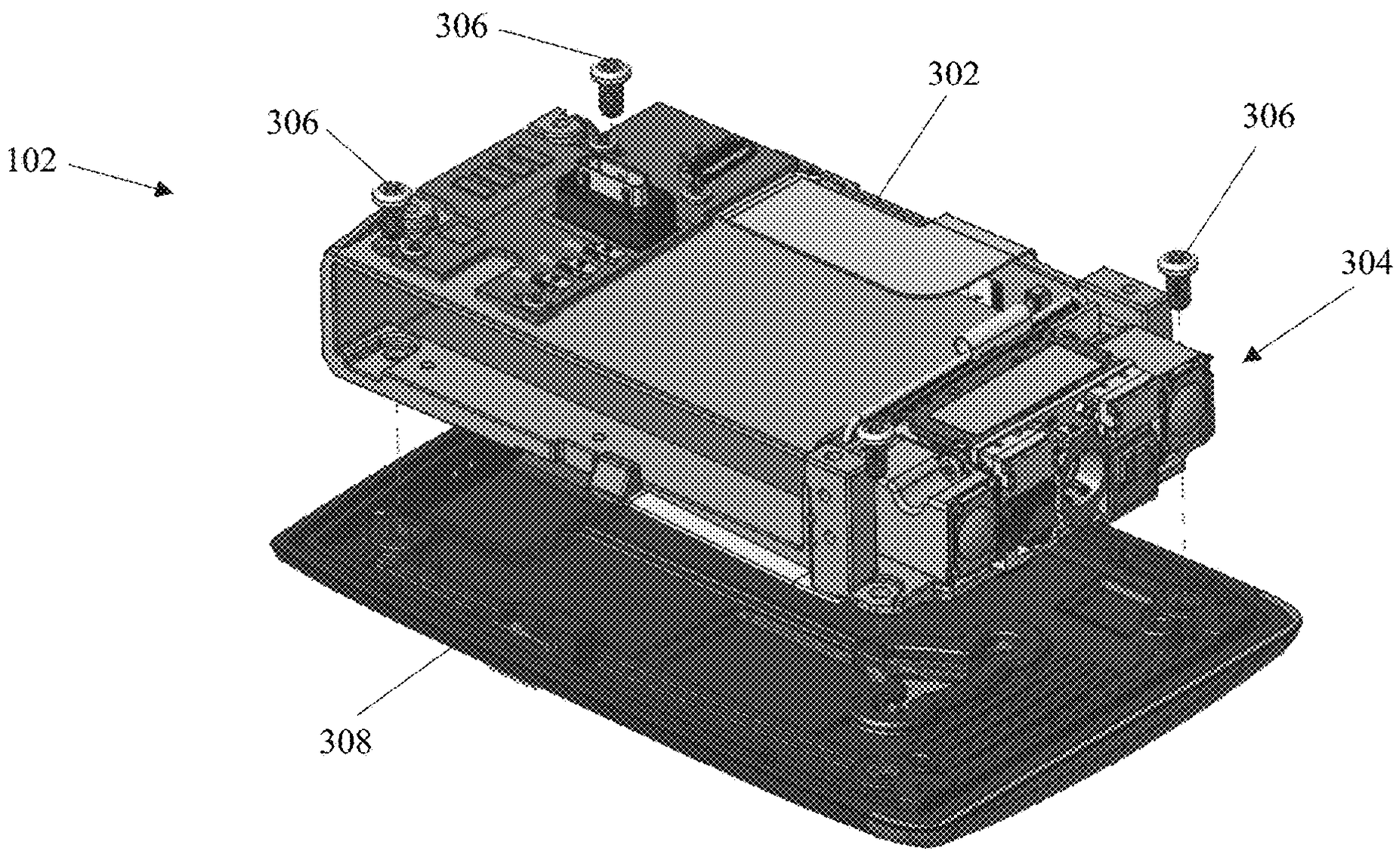
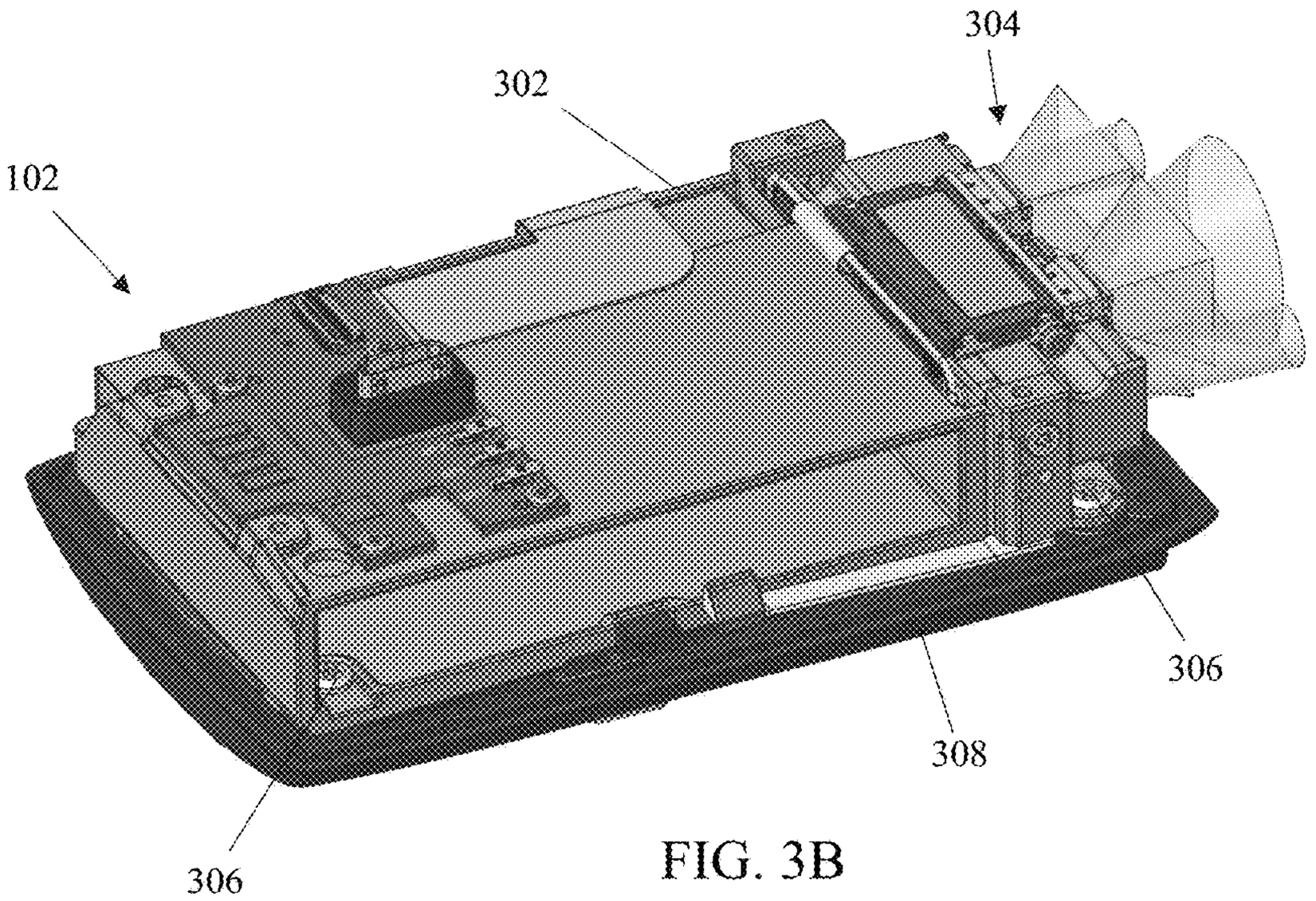


FIG. 3A



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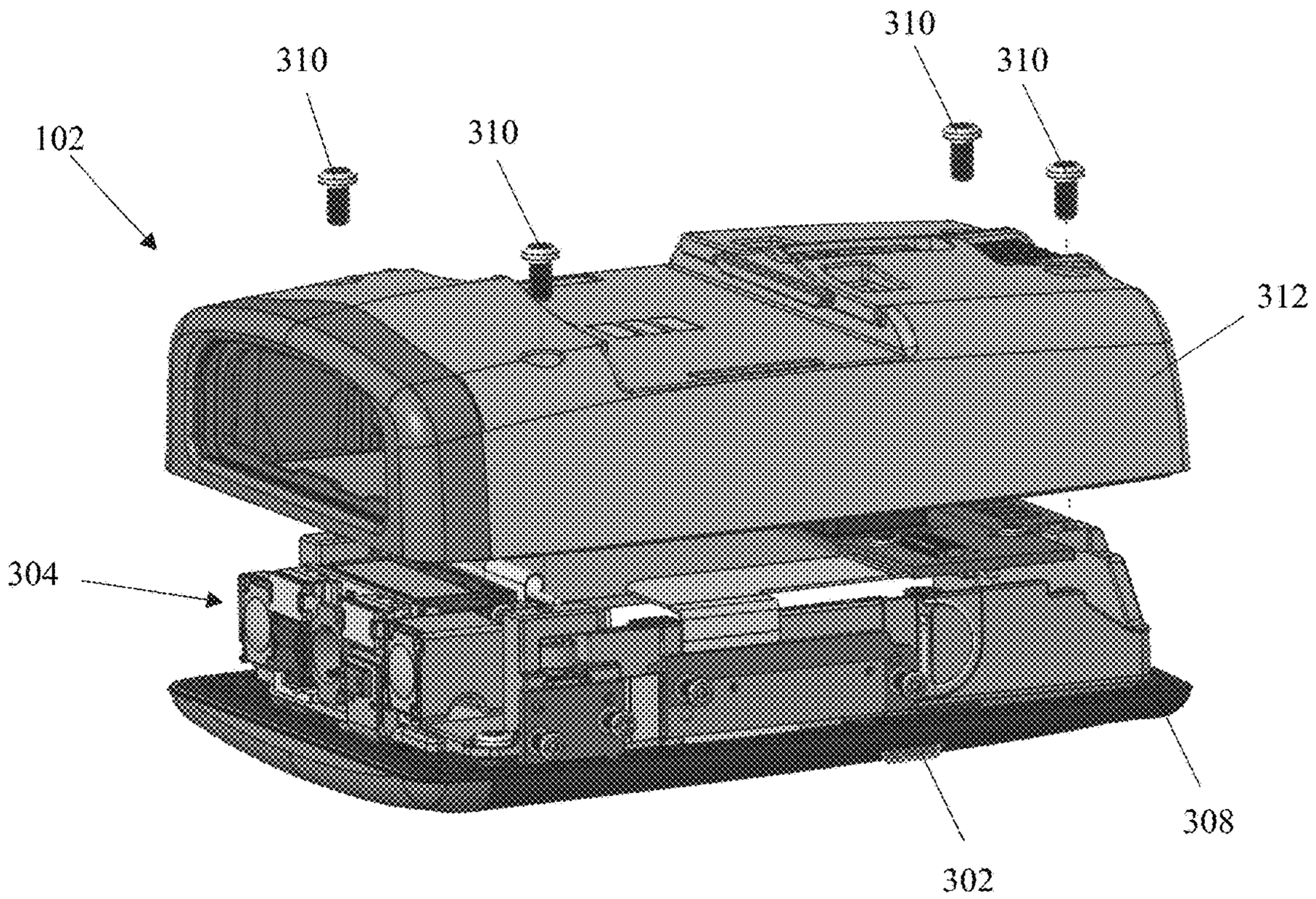
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FIG. 3C

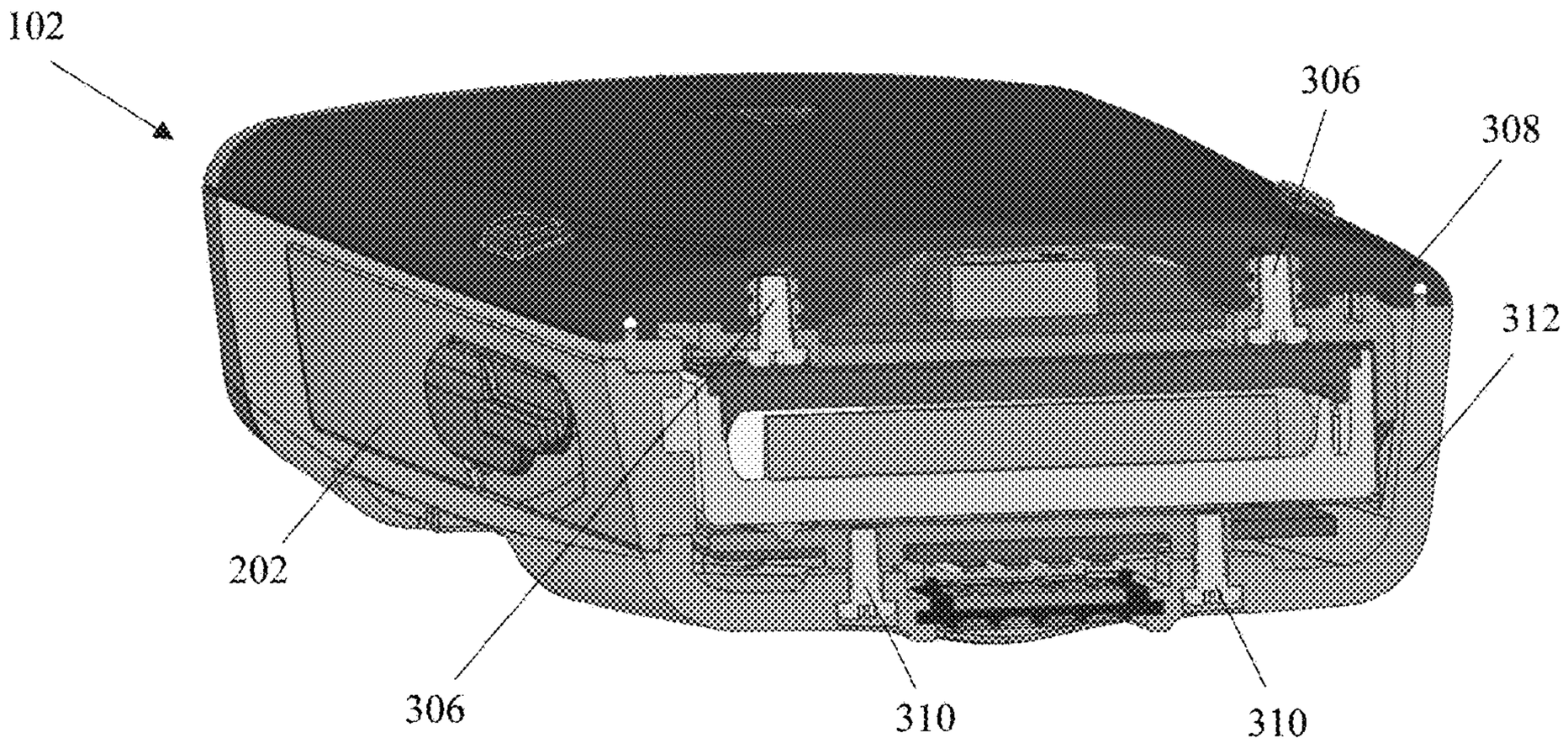
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FIG. 3D

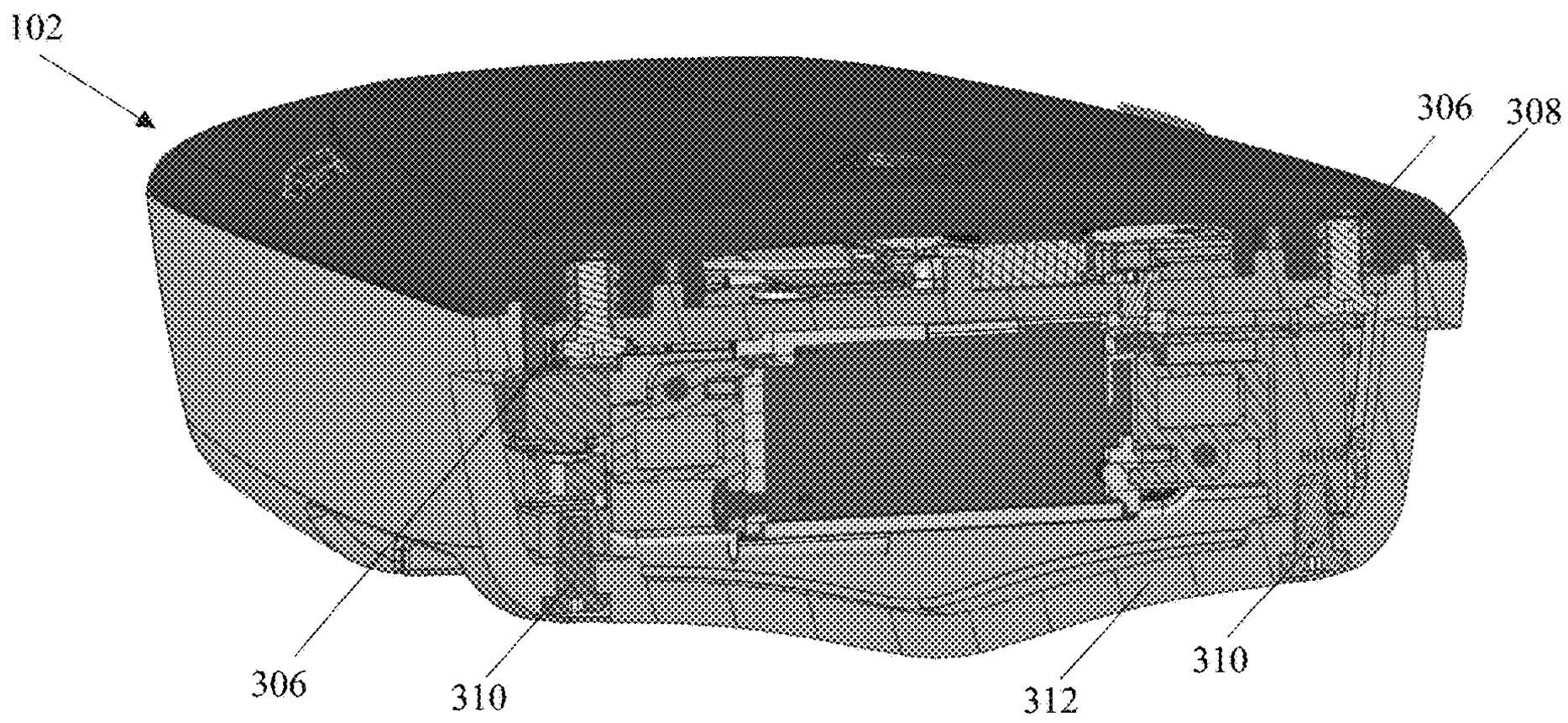


FIG. 3E

FIG. 4A

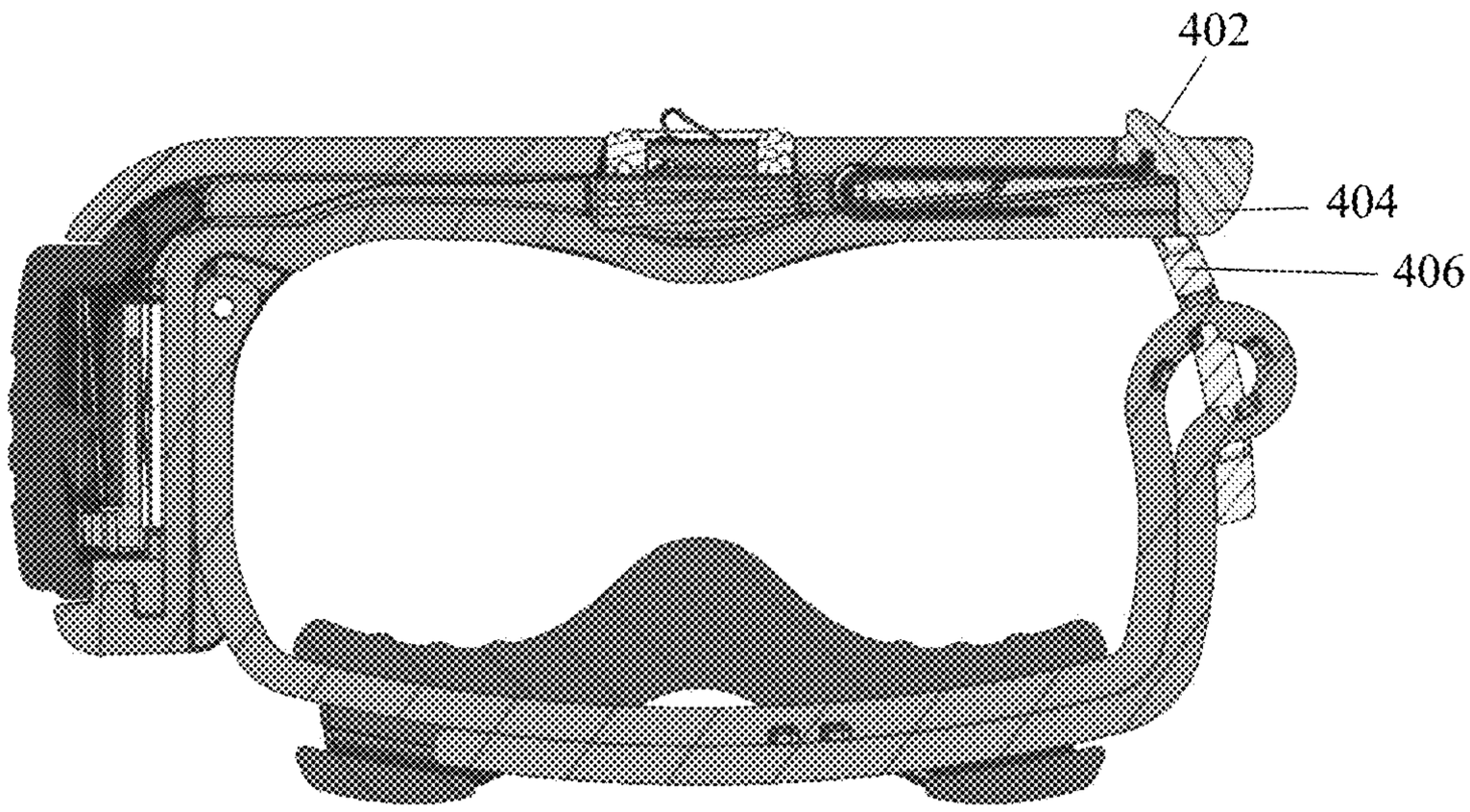
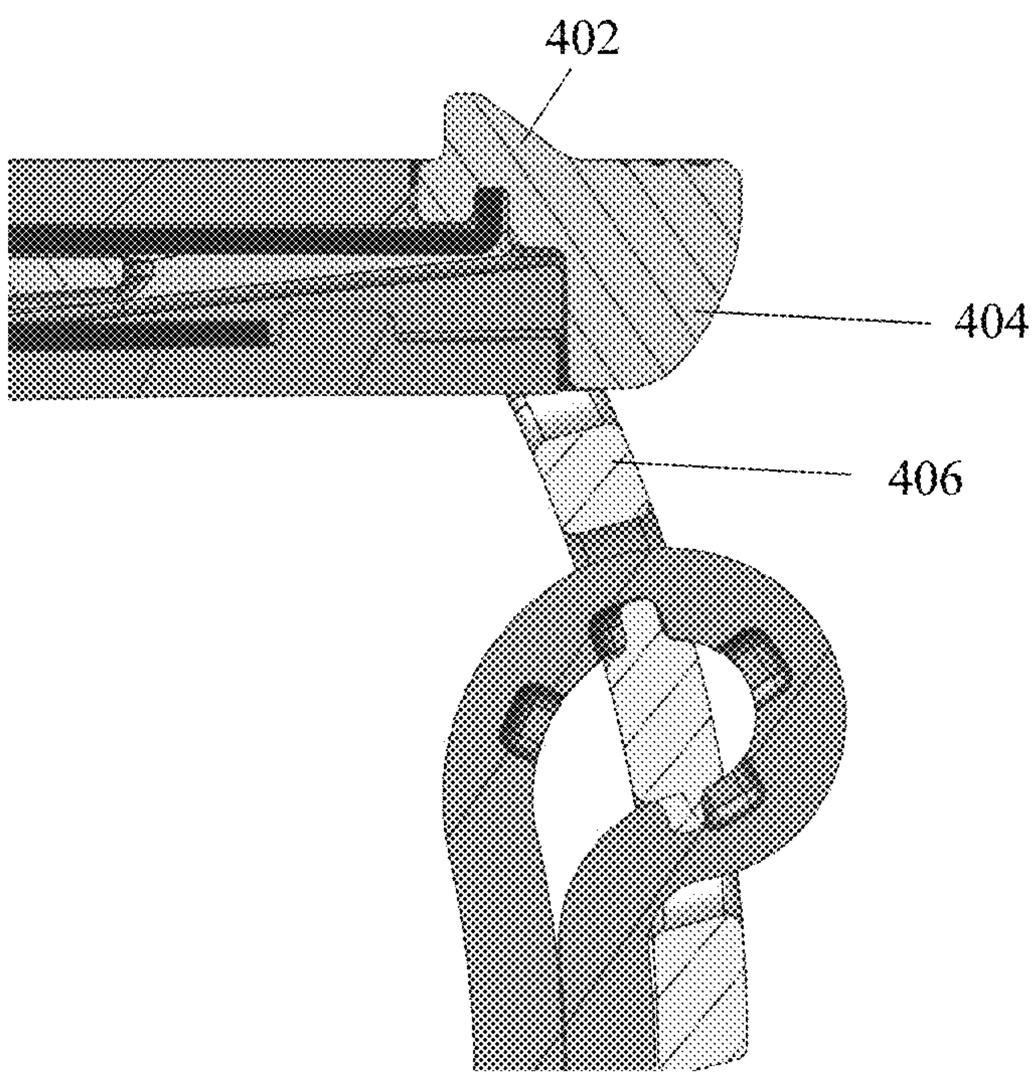


FIG. 4B



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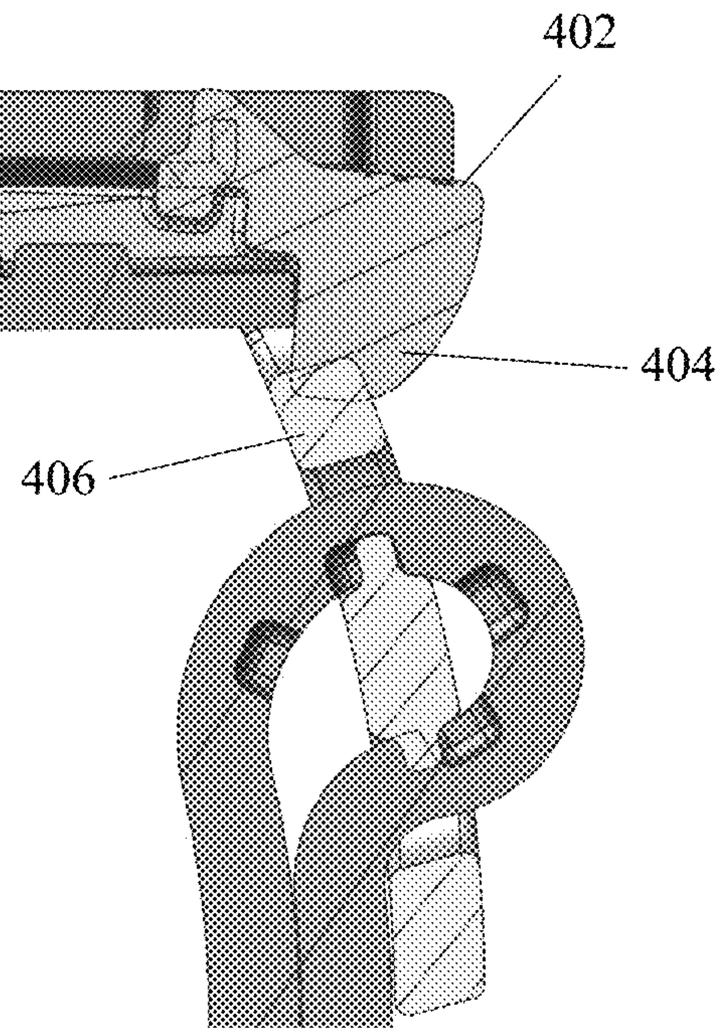


FIG. 4D

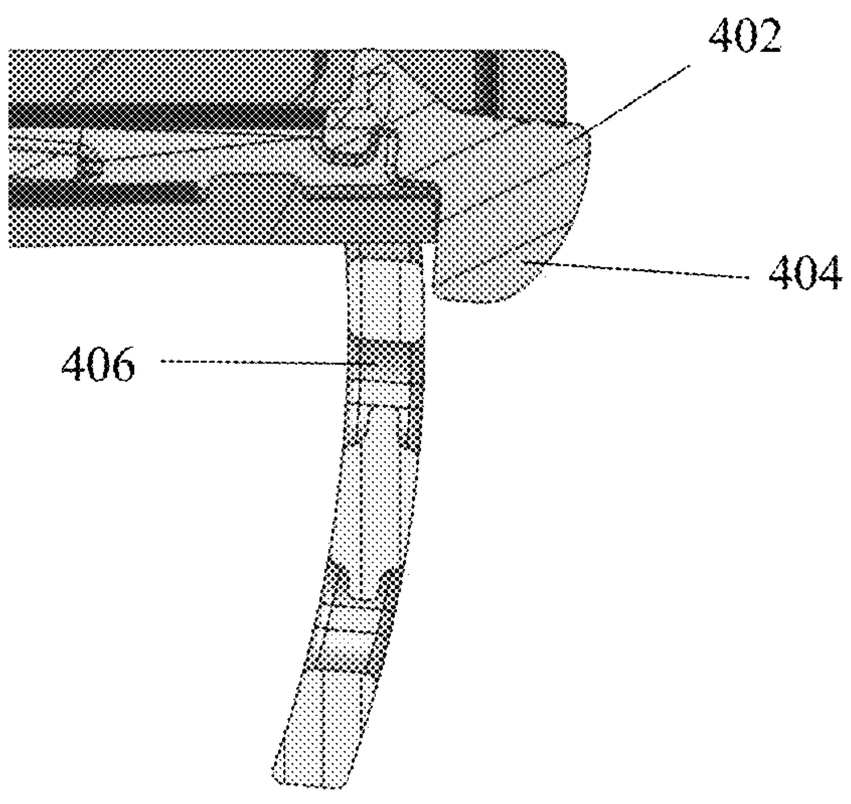


FIG. 4E

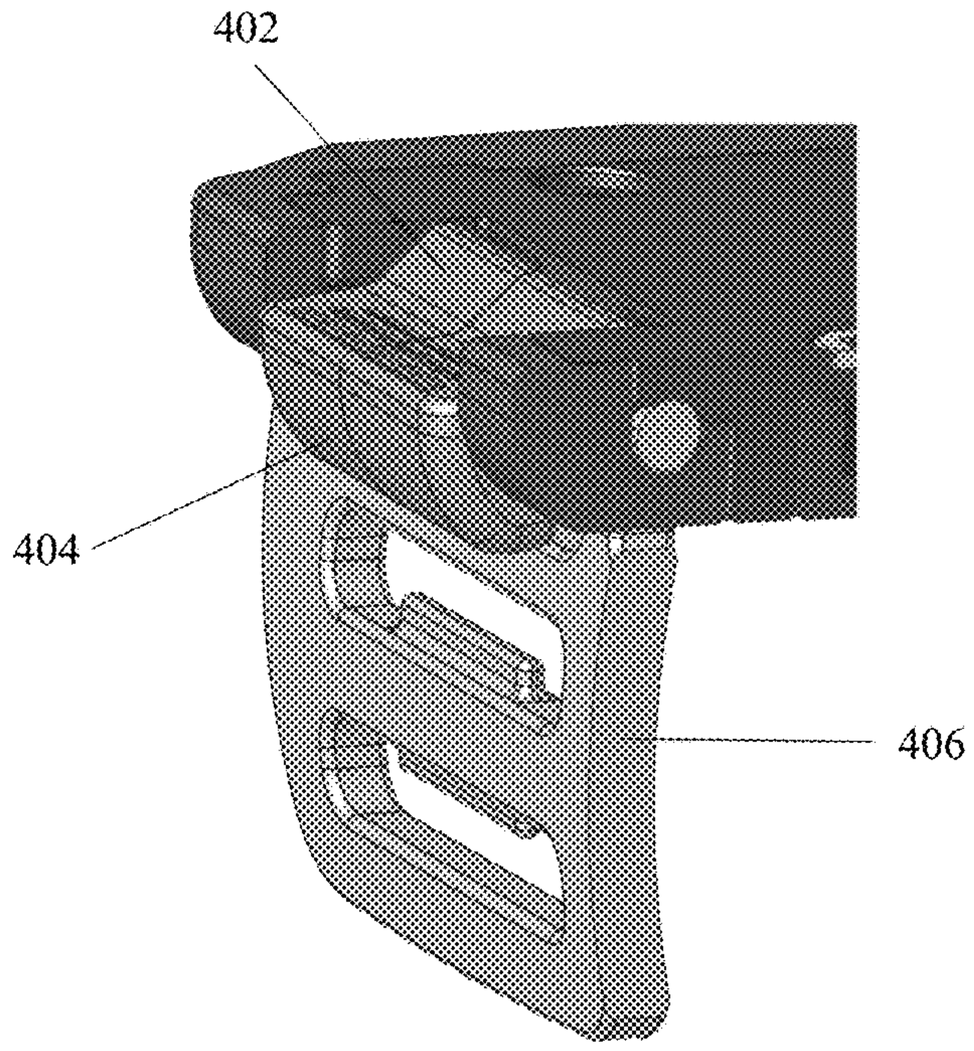


FIG. 4F

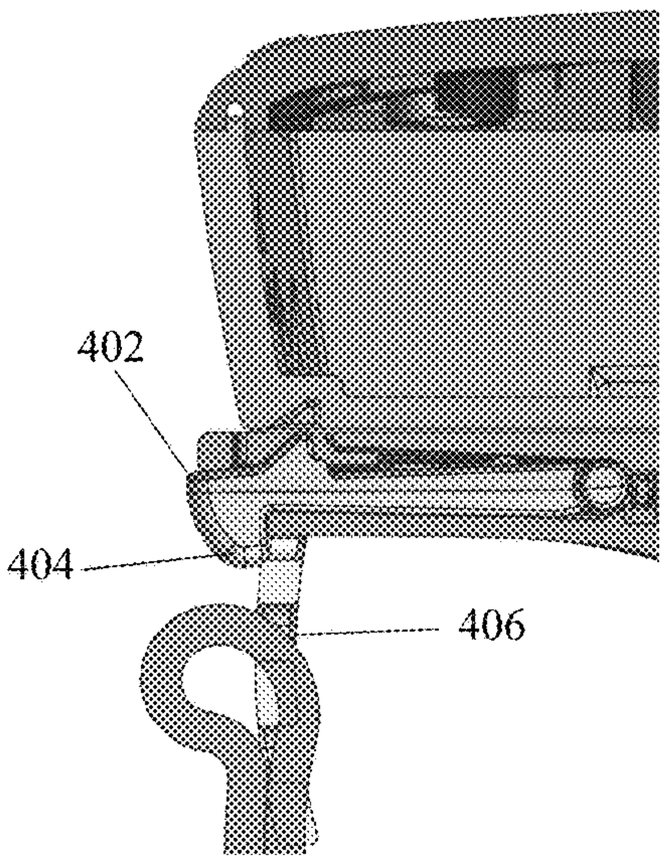


FIG. 4G

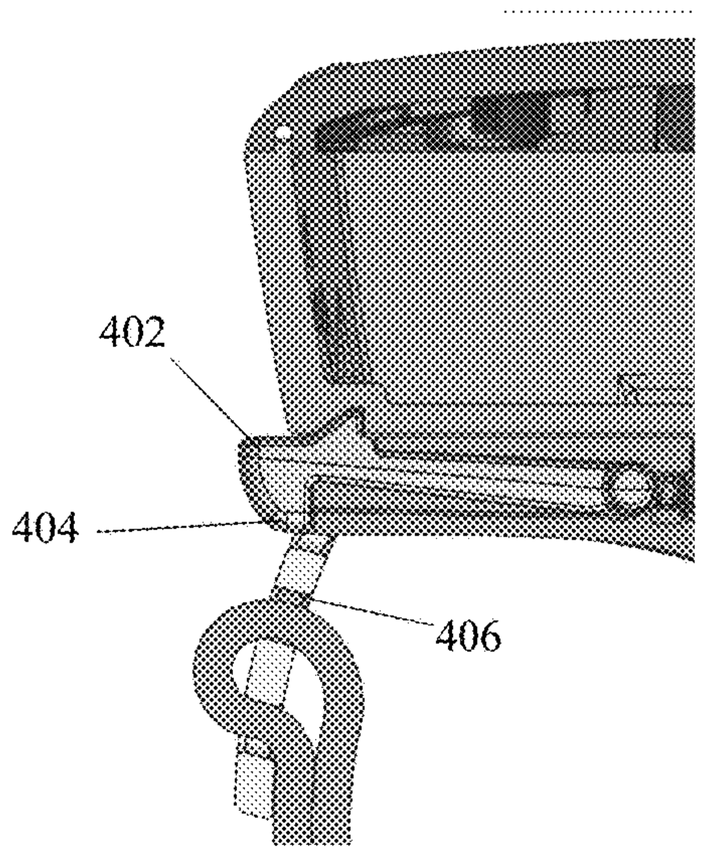


FIG. 4H

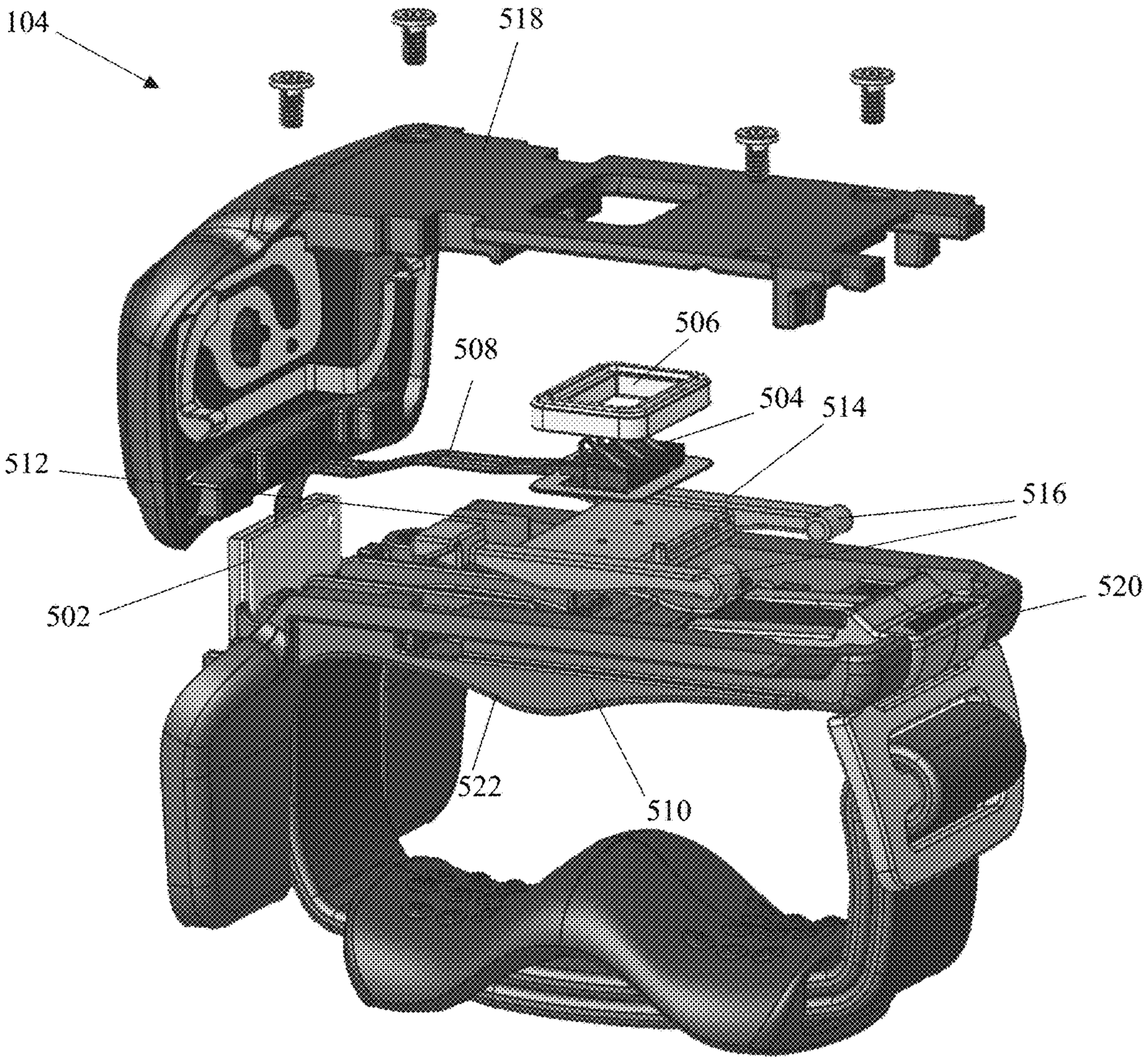


FIG. 5

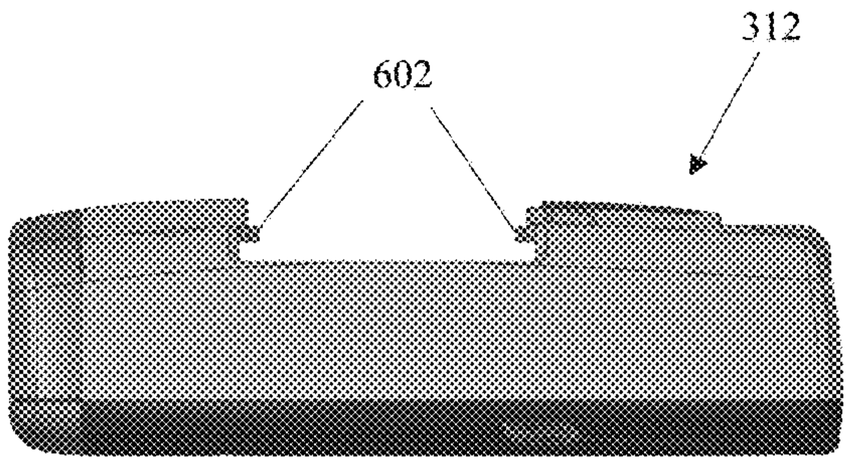


FIG. 6A

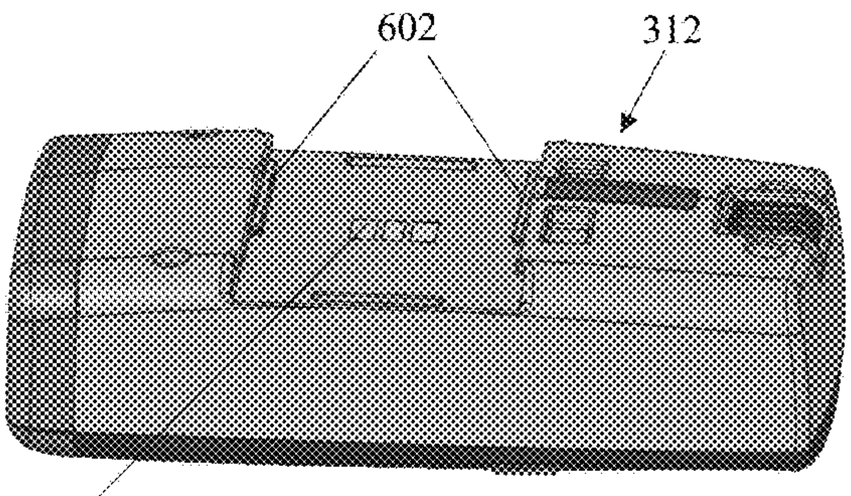


FIG. 6B

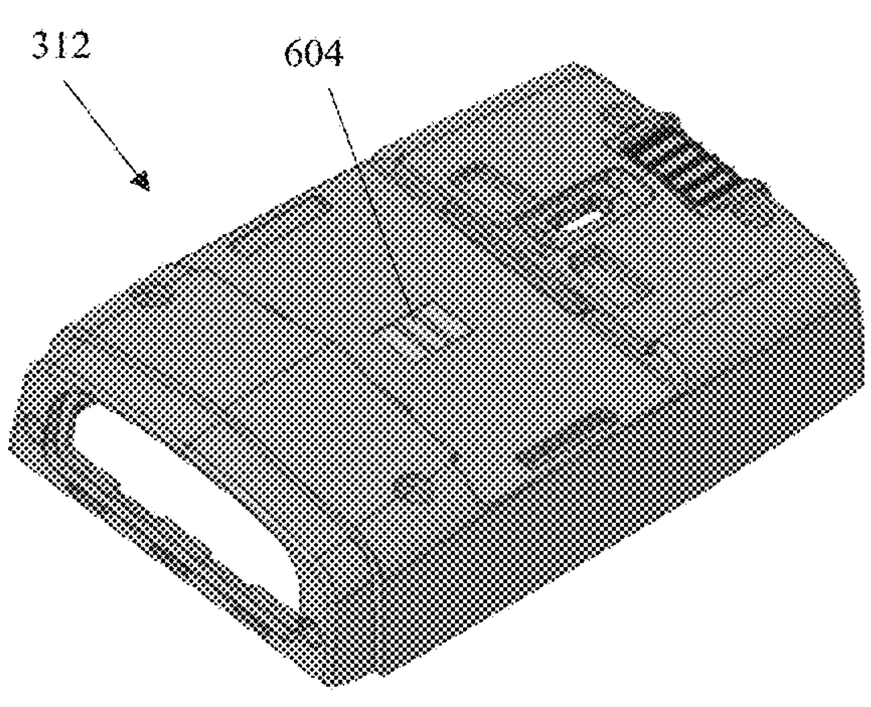


FIG. 6C

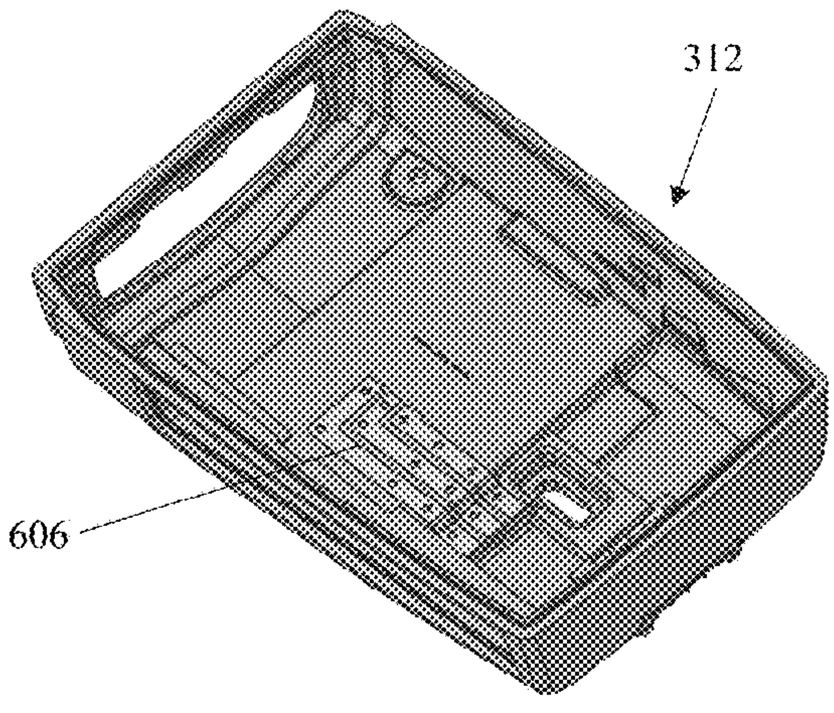


FIG. 6D

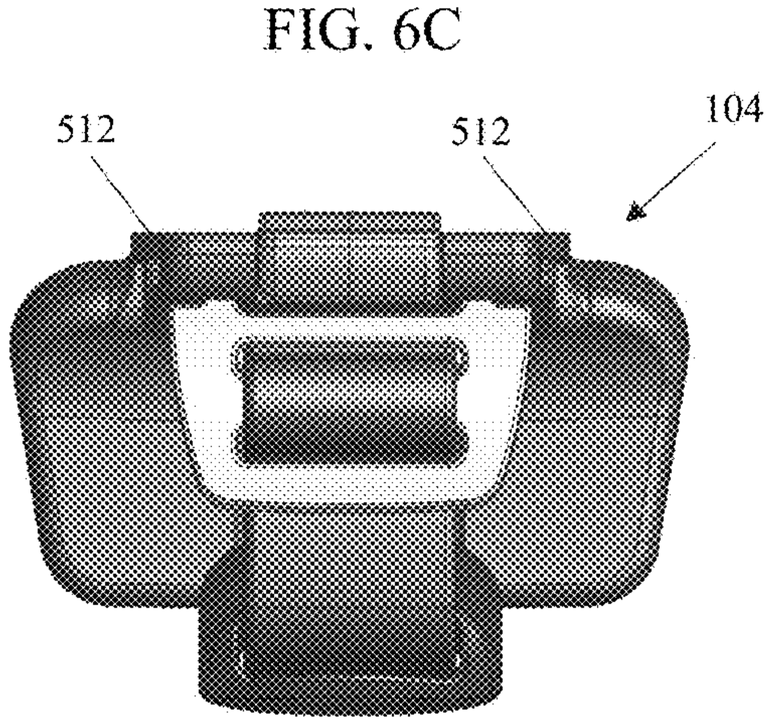
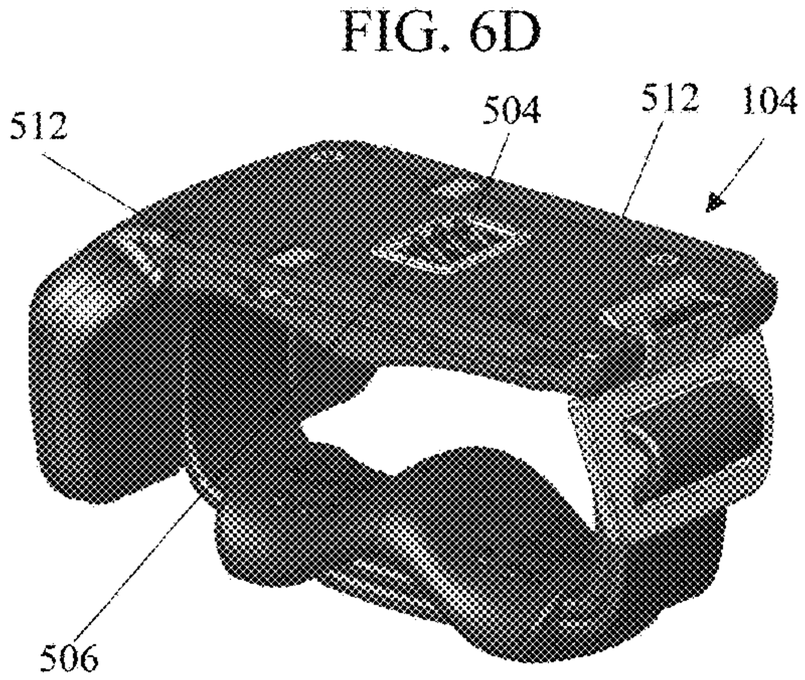


FIG. 7A



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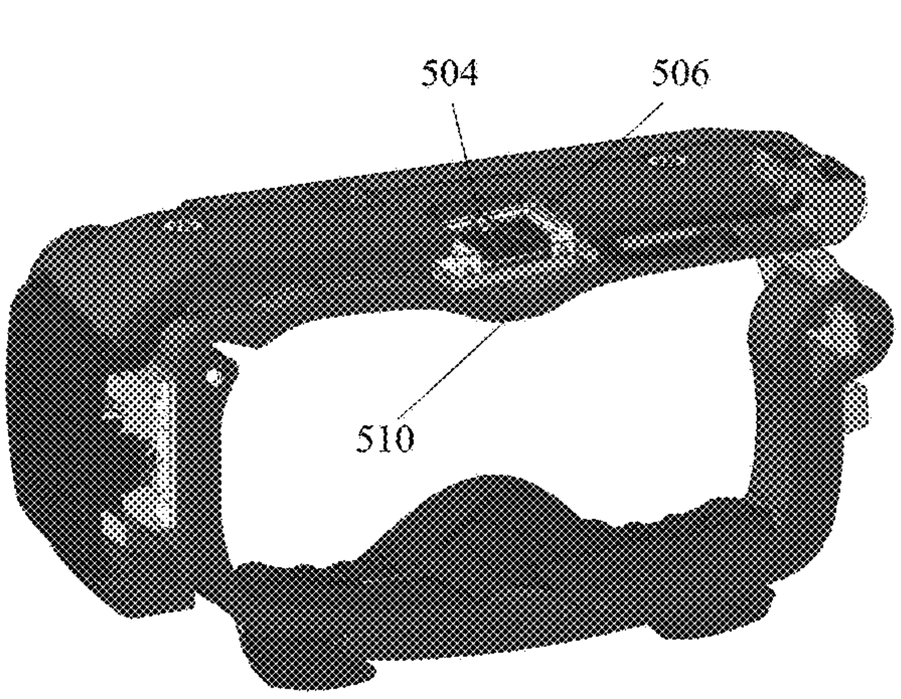

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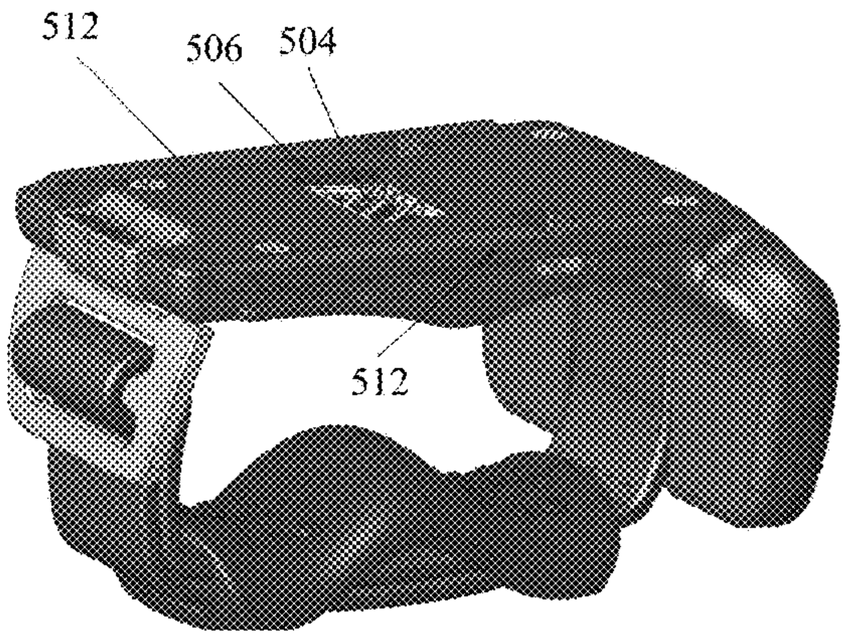

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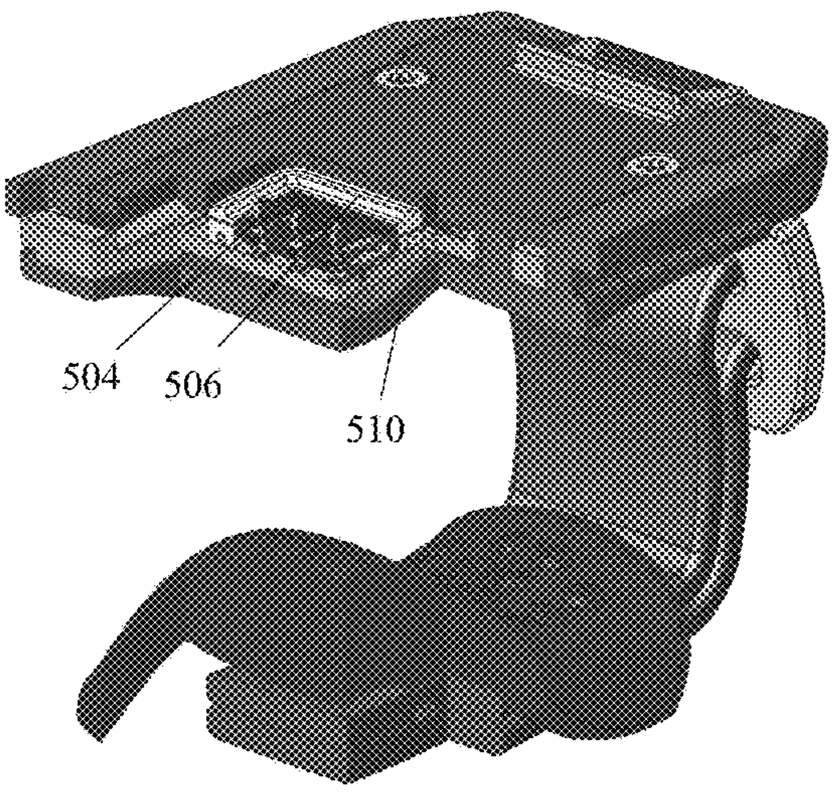
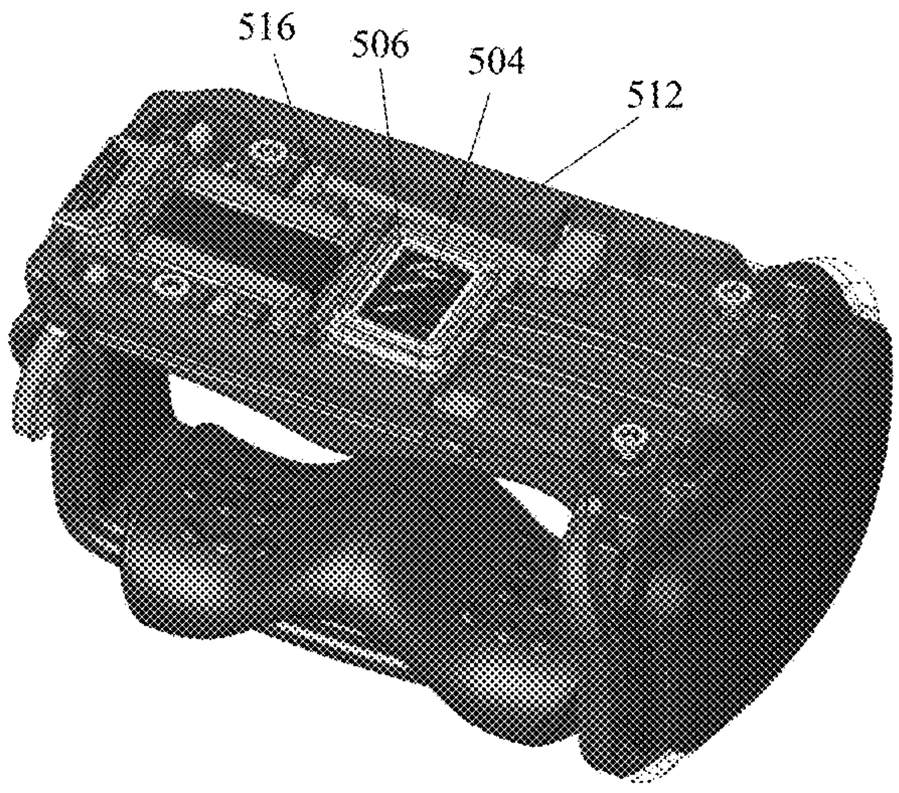


FIG. 7E



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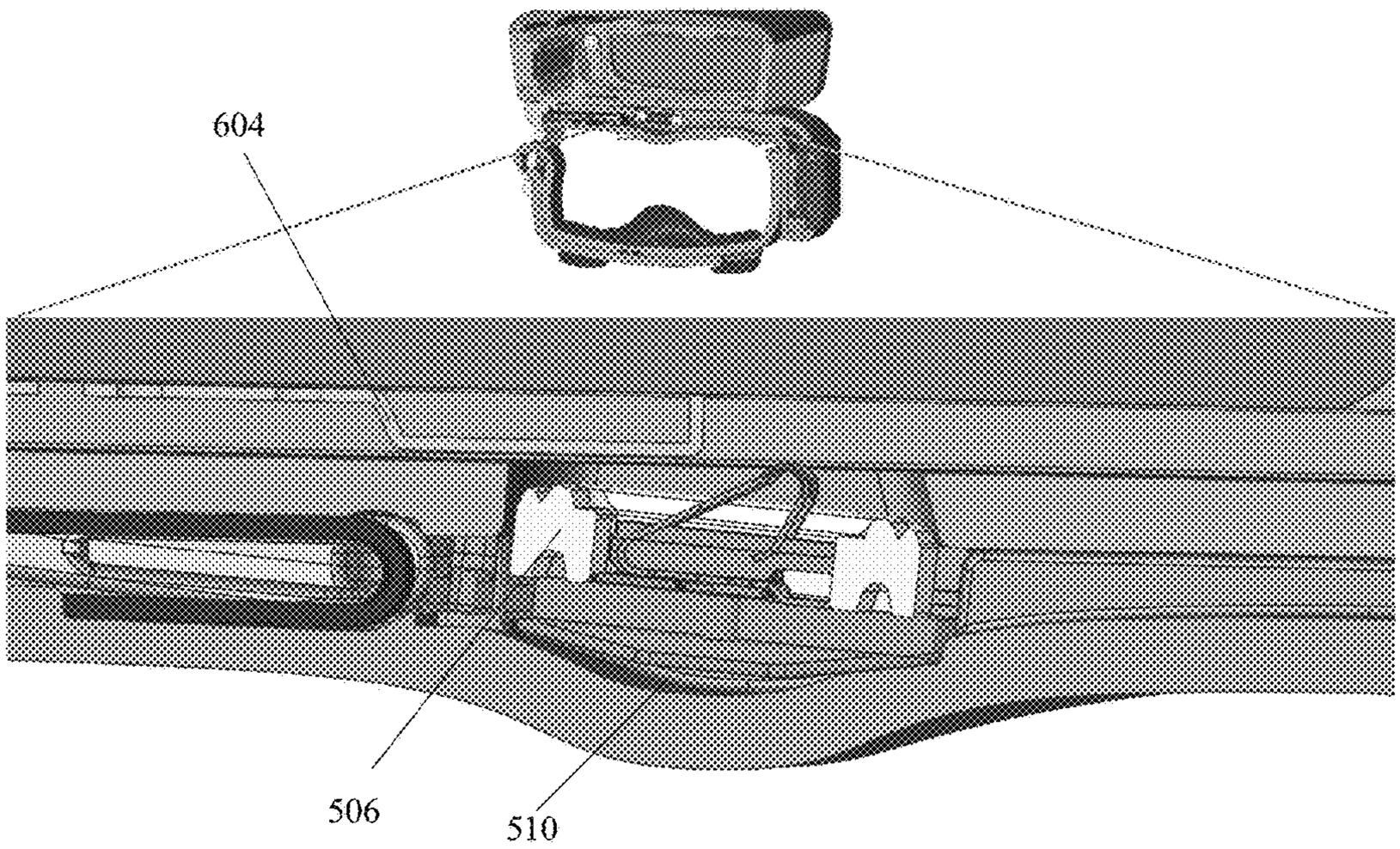

FIG. 7G

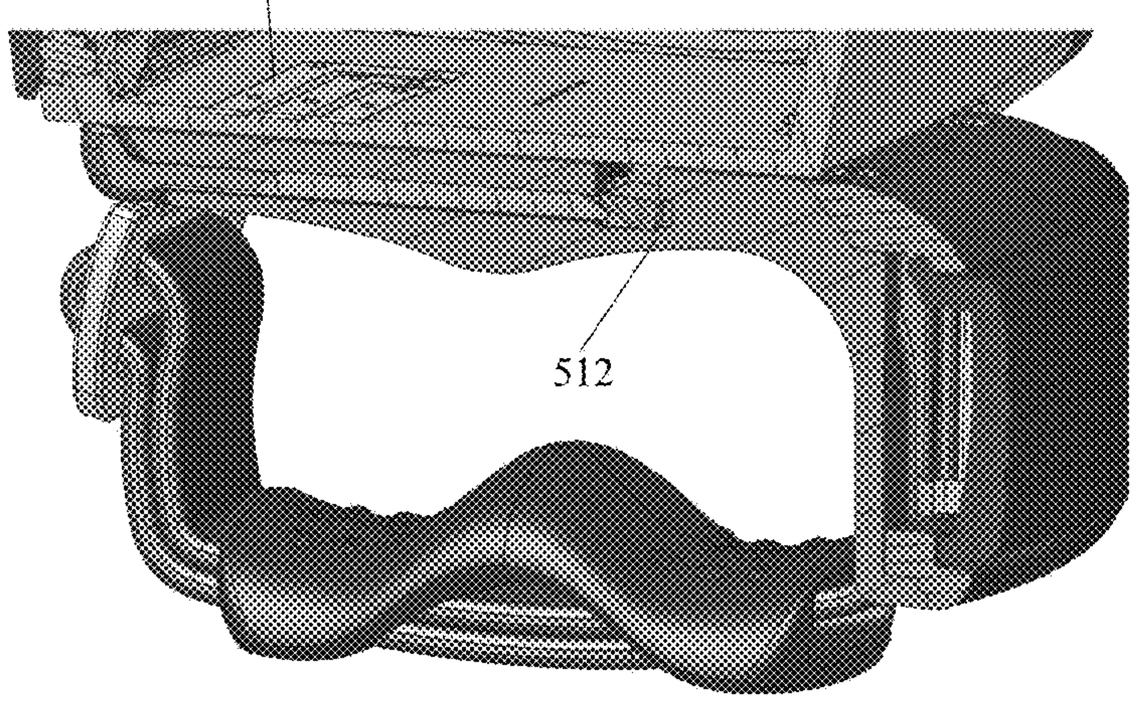

FIG. 7H

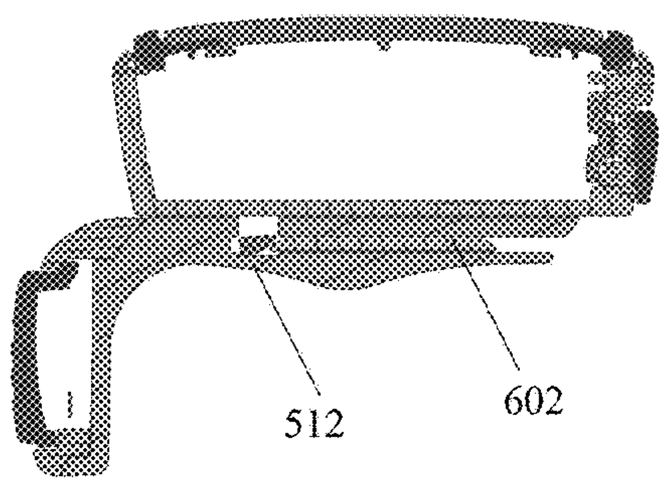

FIG. 7I

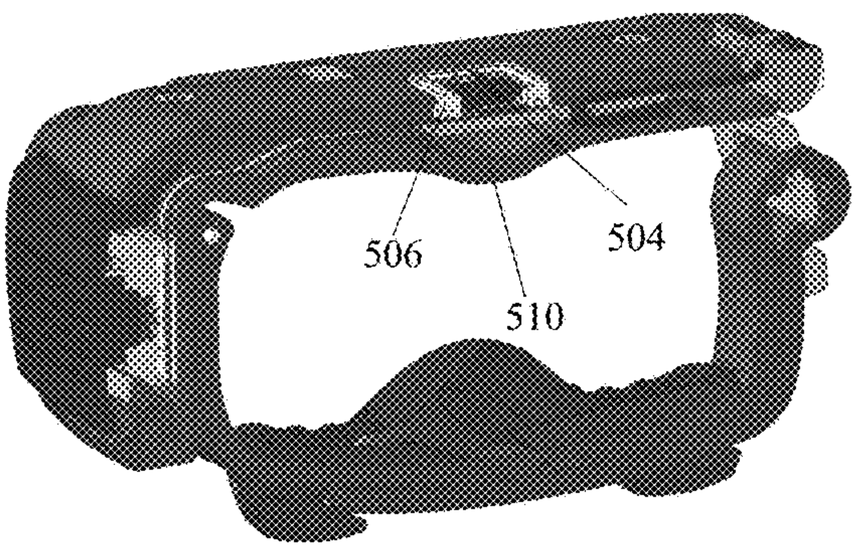

FIG. 7J

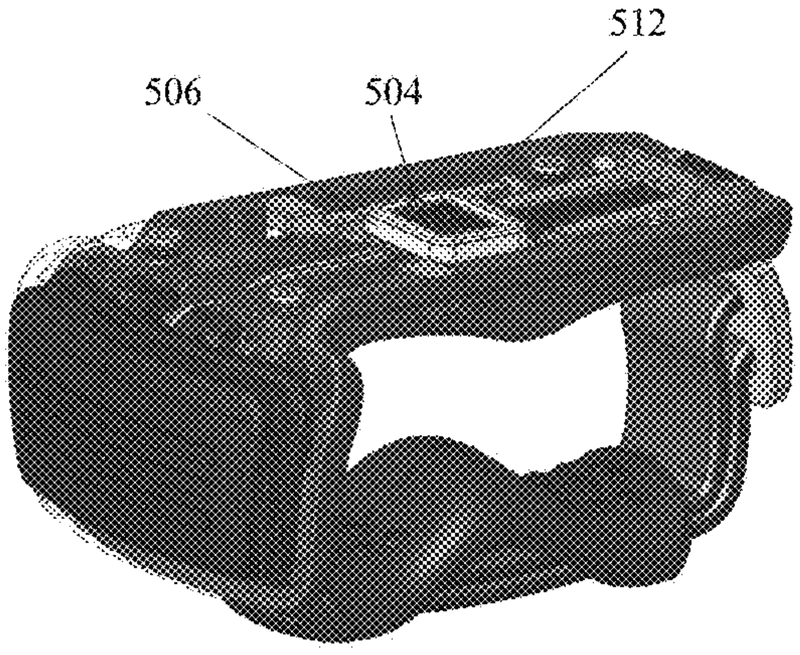

FIG. 7K

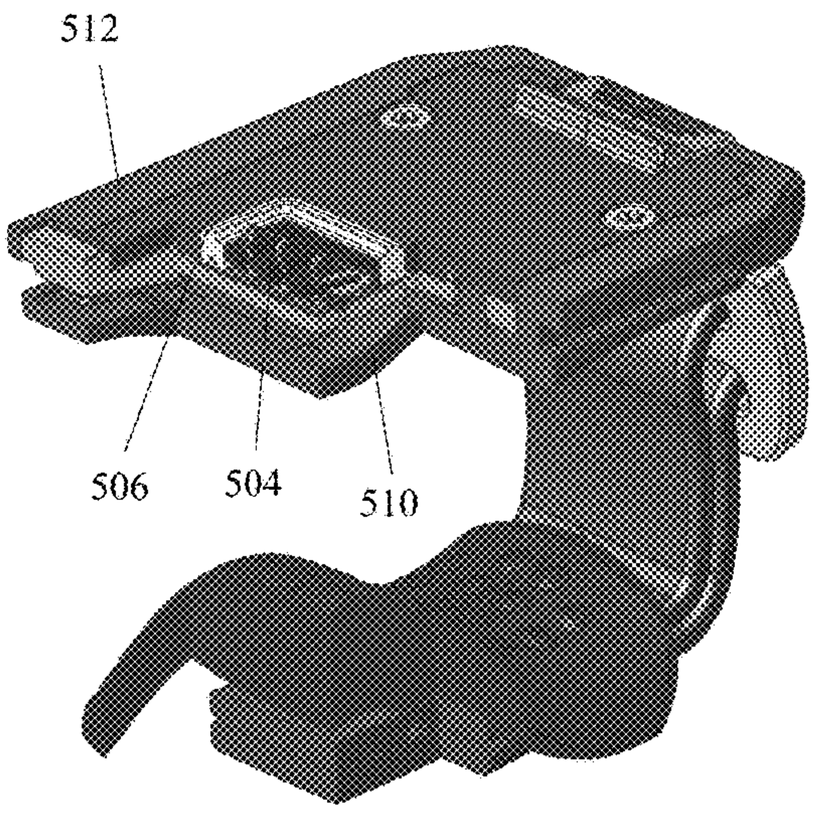

FIG. 7L

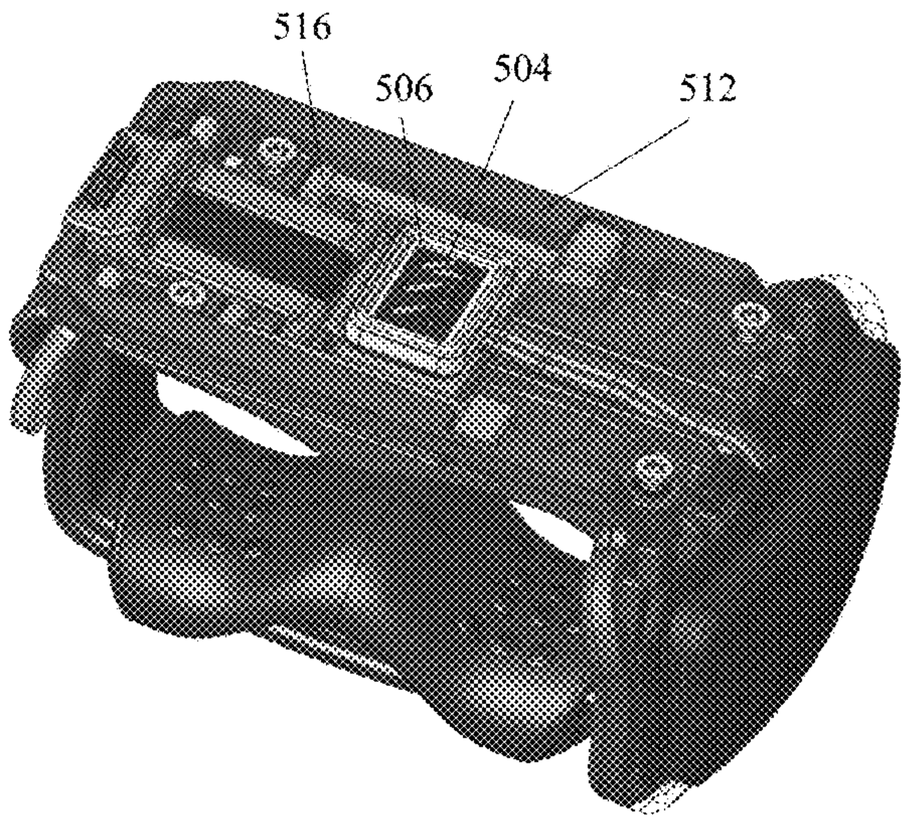

FIG. 7M

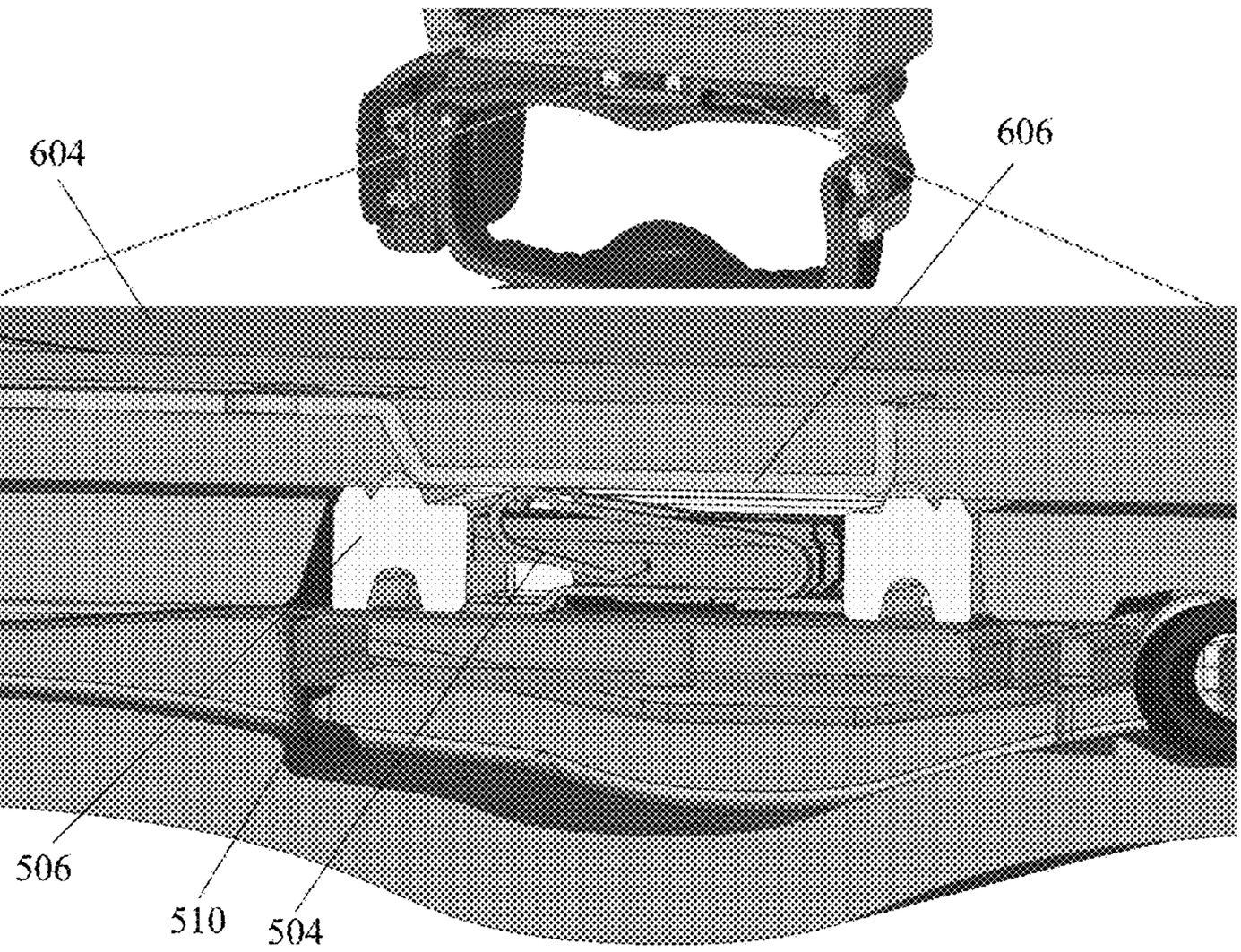

FIG. 7N

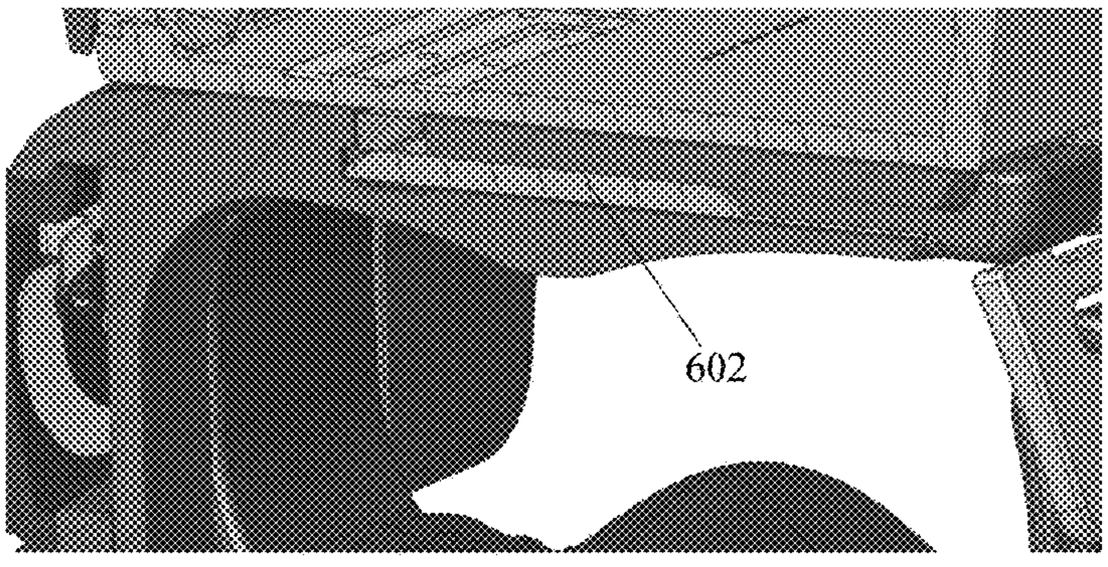

FIG. 7O

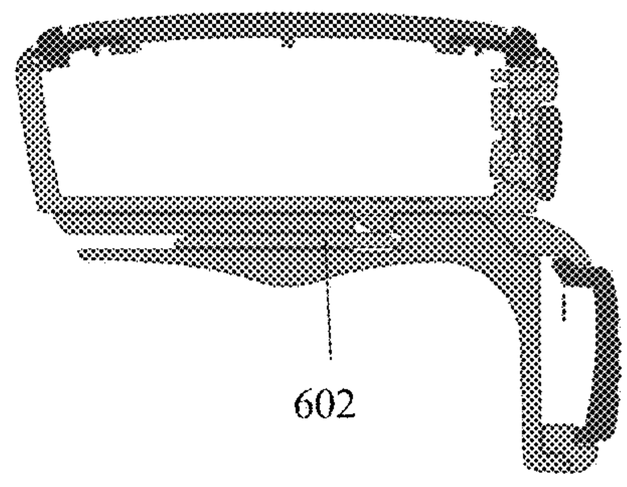

FIG. 7P

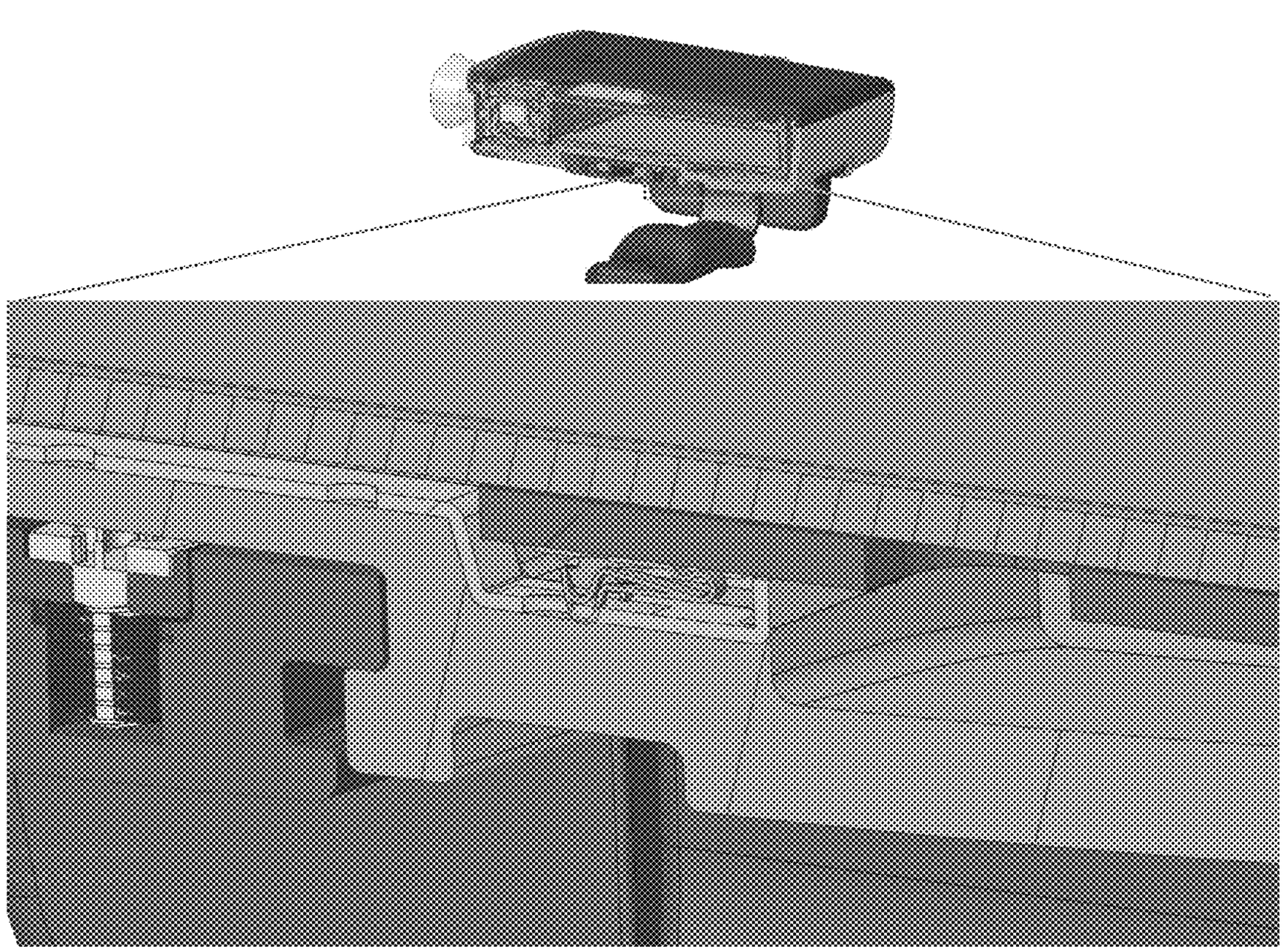

FIG. 7Q

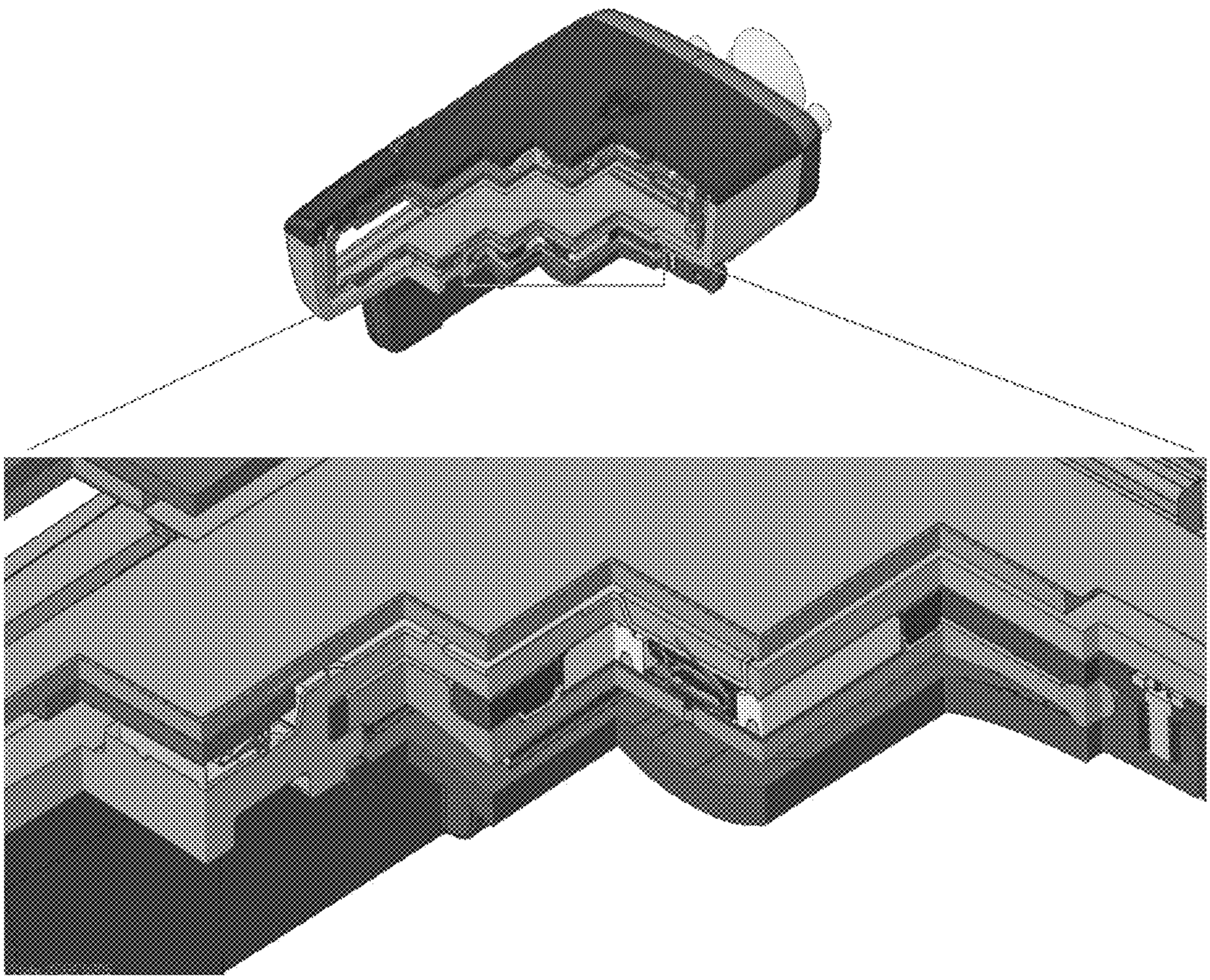

FIG. 7R

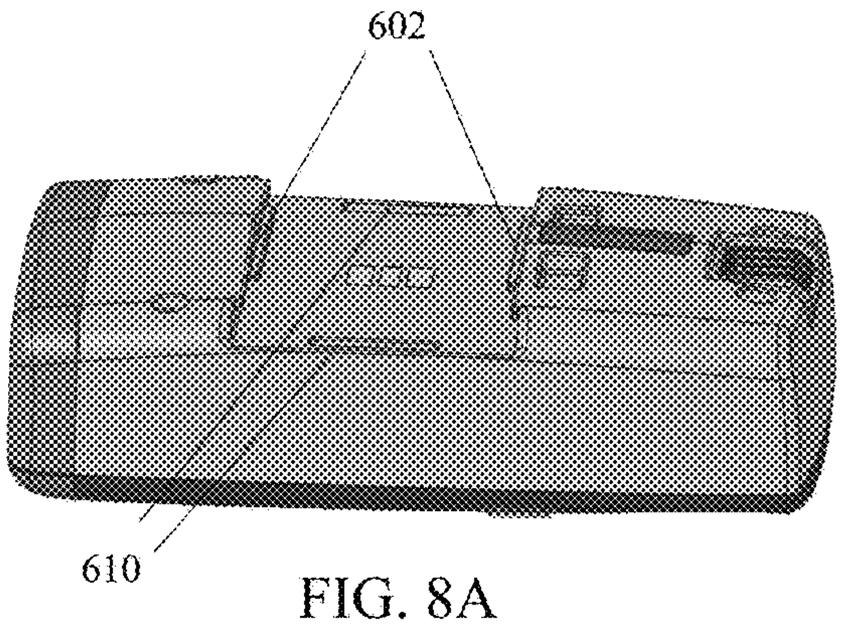

FIG. 8A

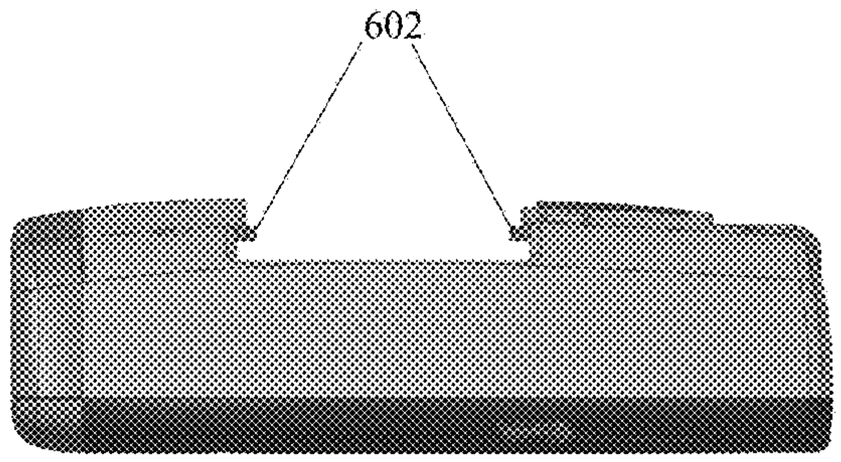

FIG. 8B

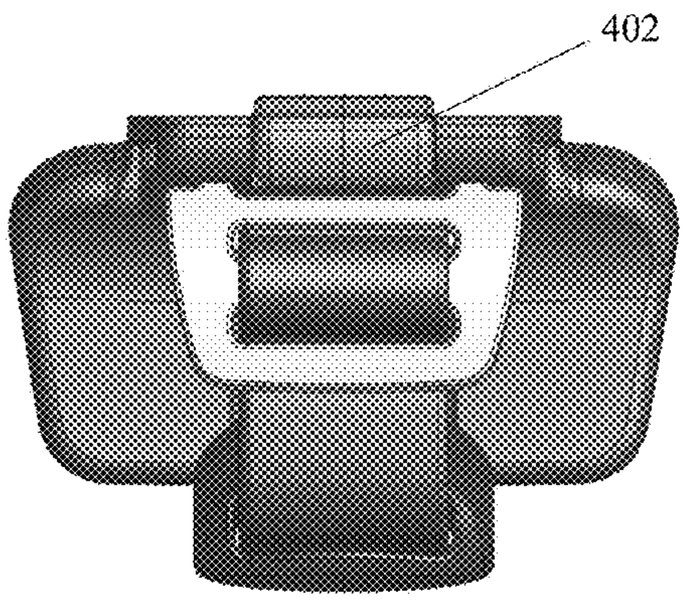

FIG. 9A

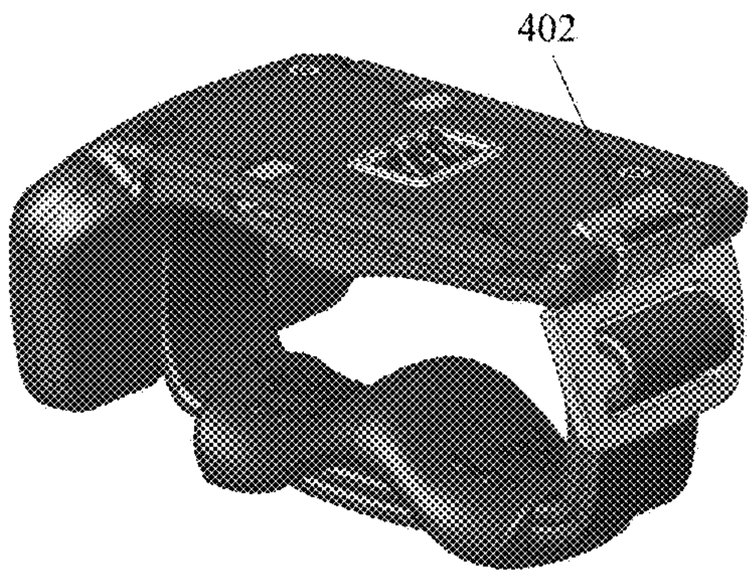

FIG. 9B

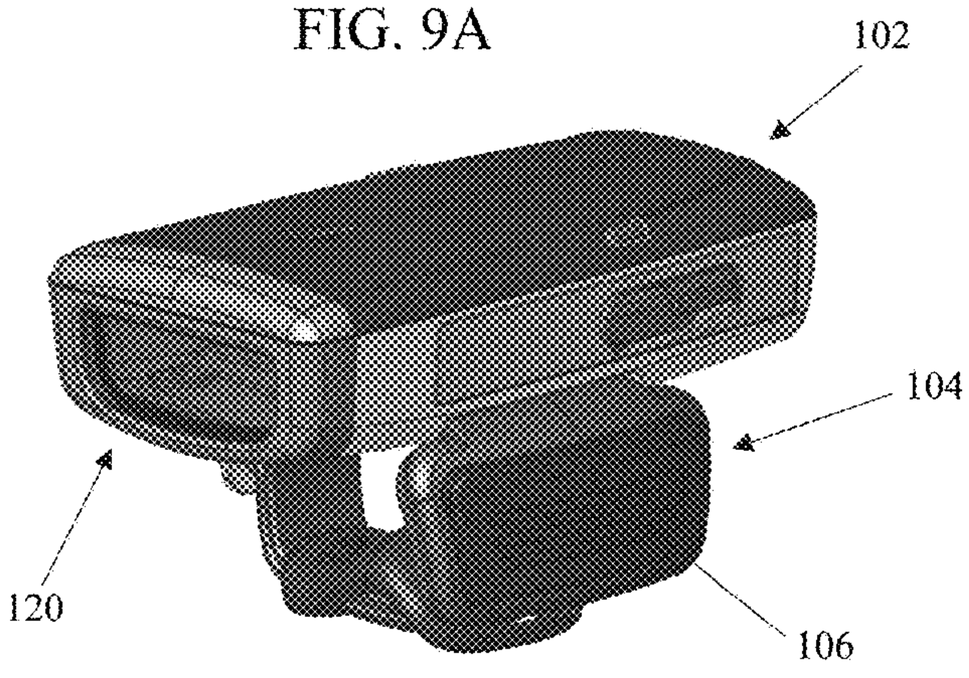

FIG. 10A

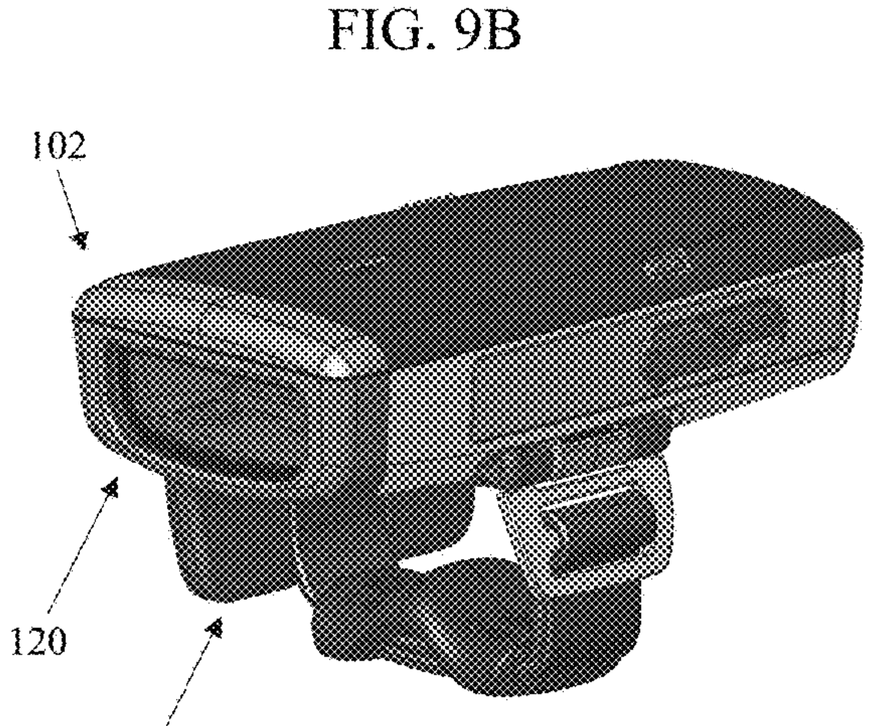

FIG. 10B

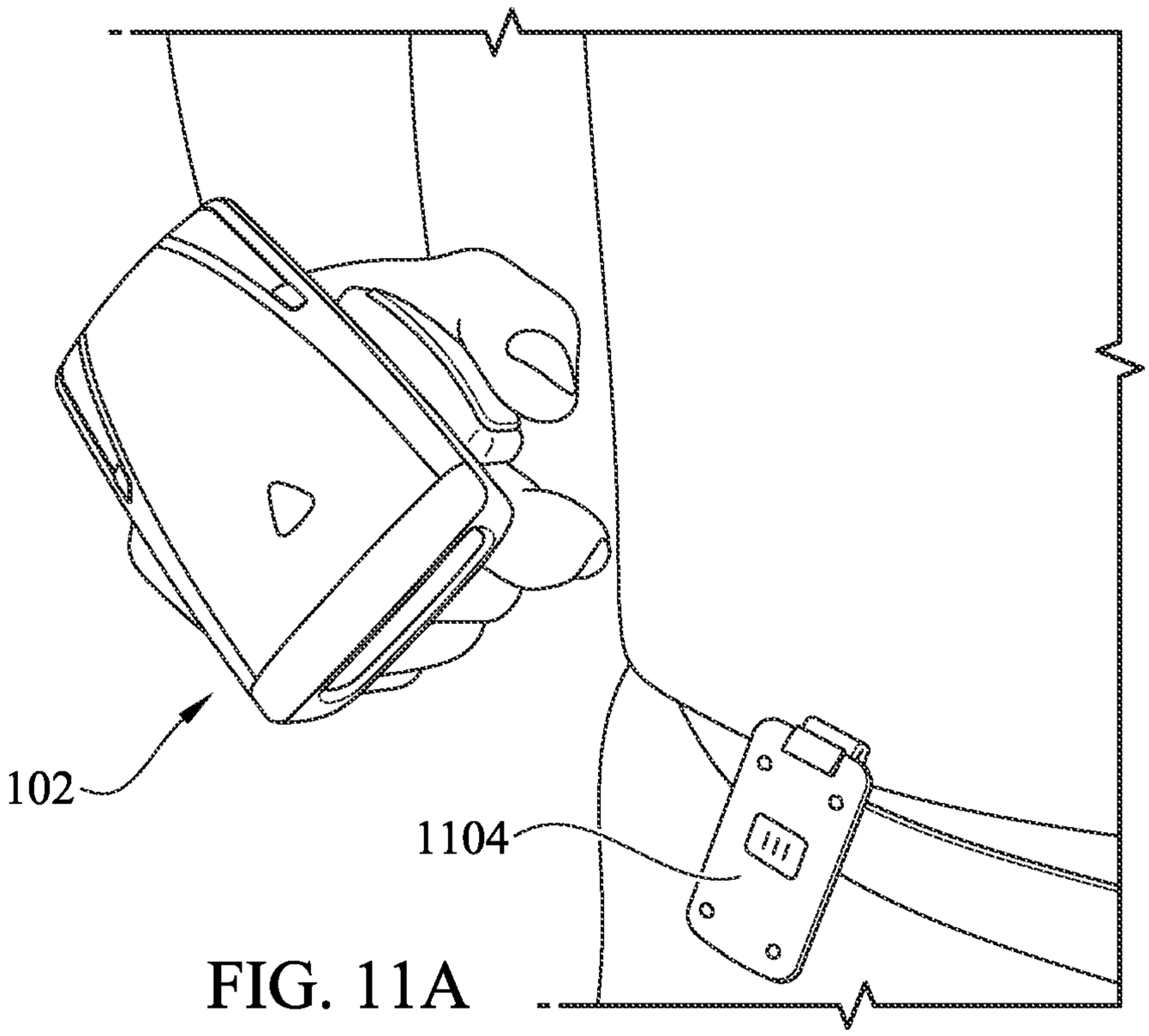

FIG. 11A

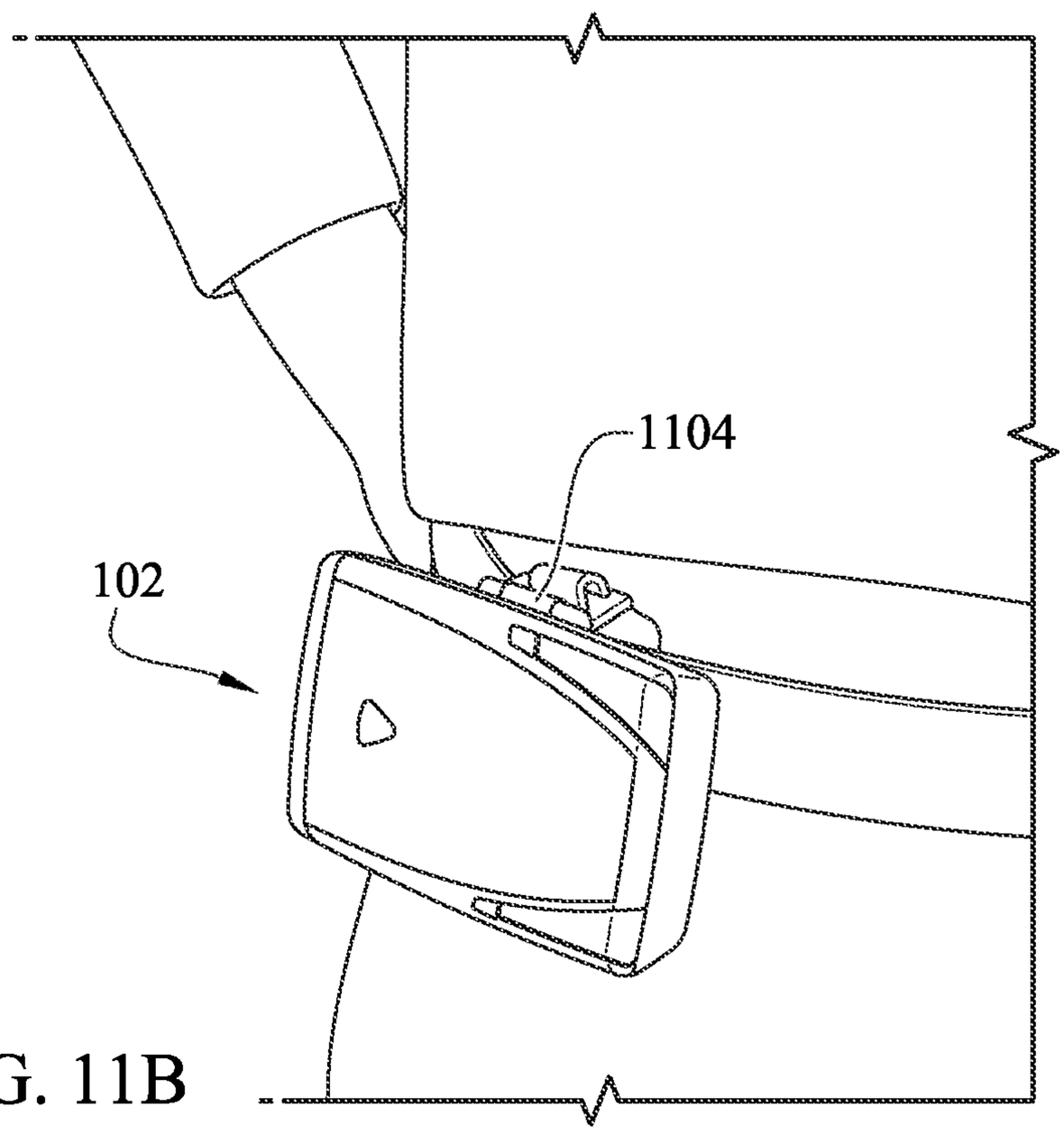

FIG. 11B

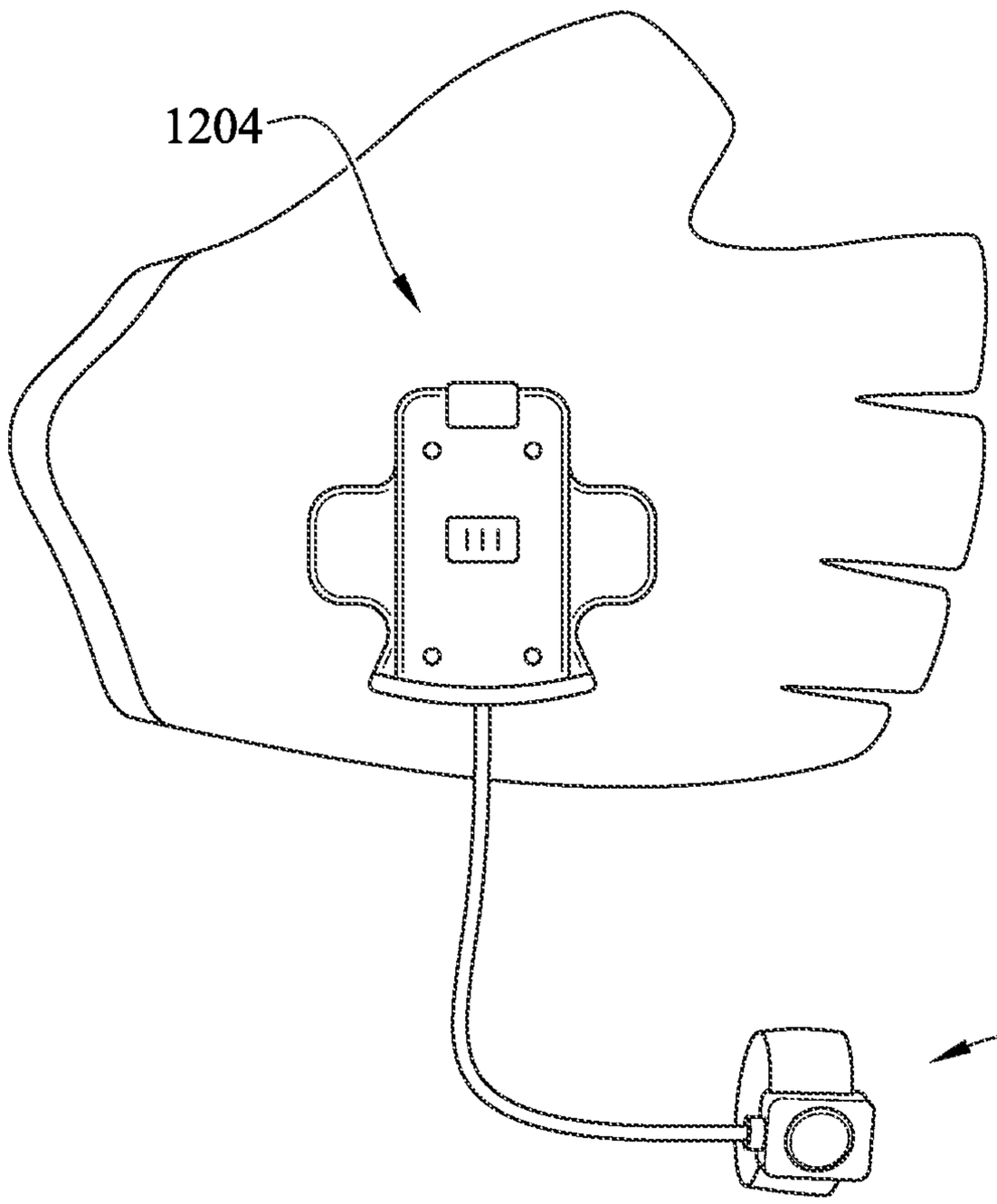

FIG. 12A

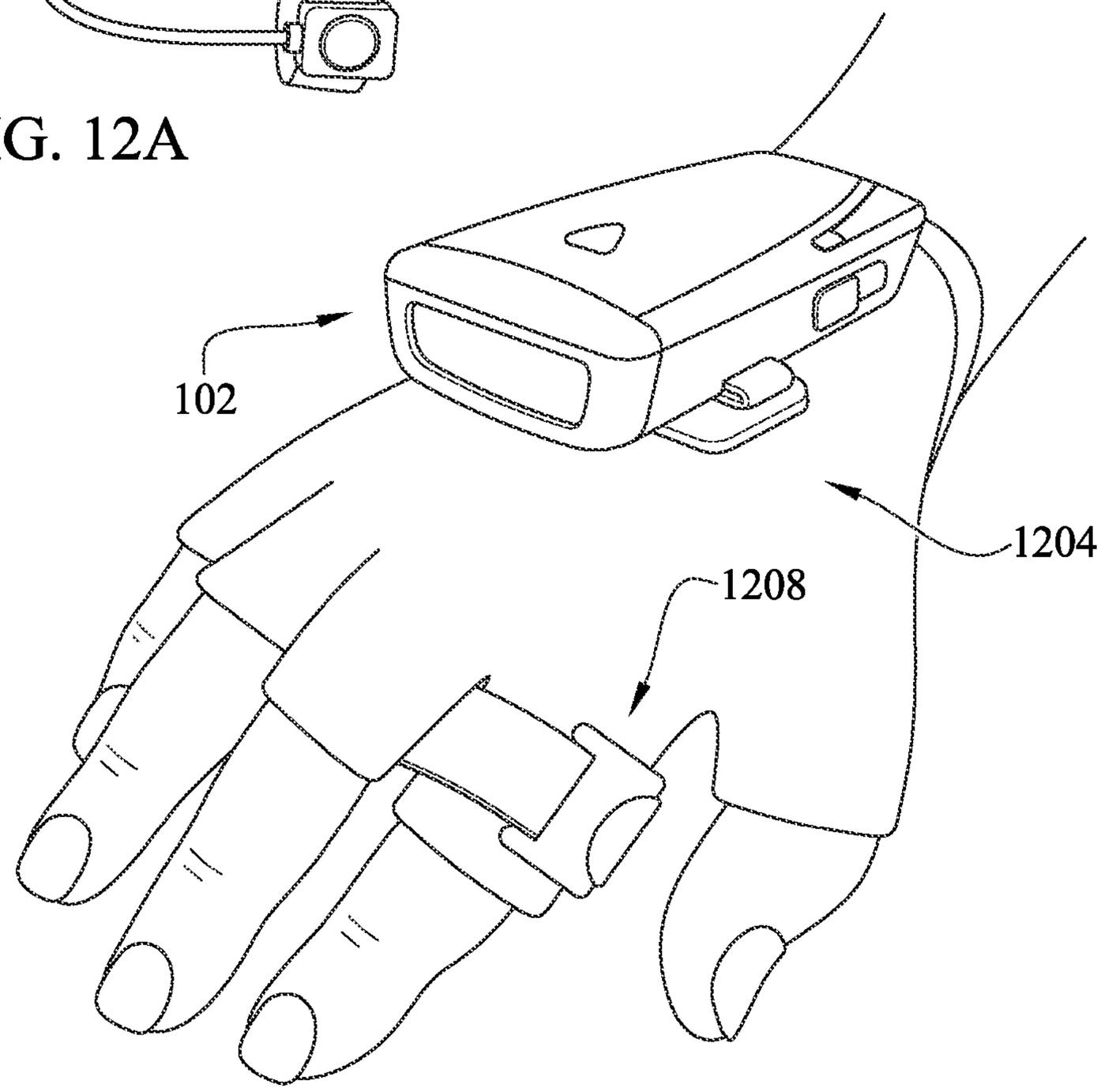

FIG. 12B

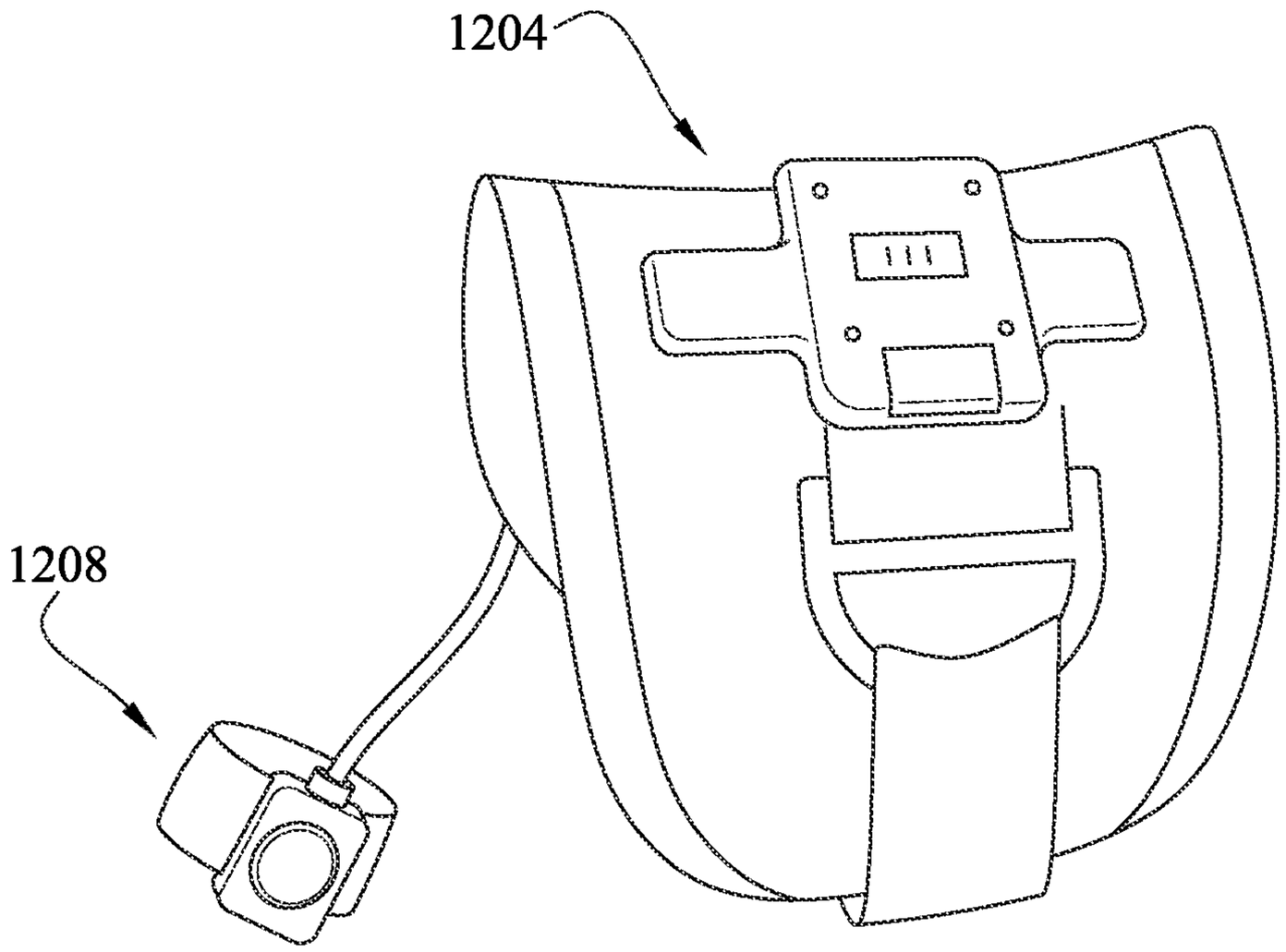

FIG. 12C

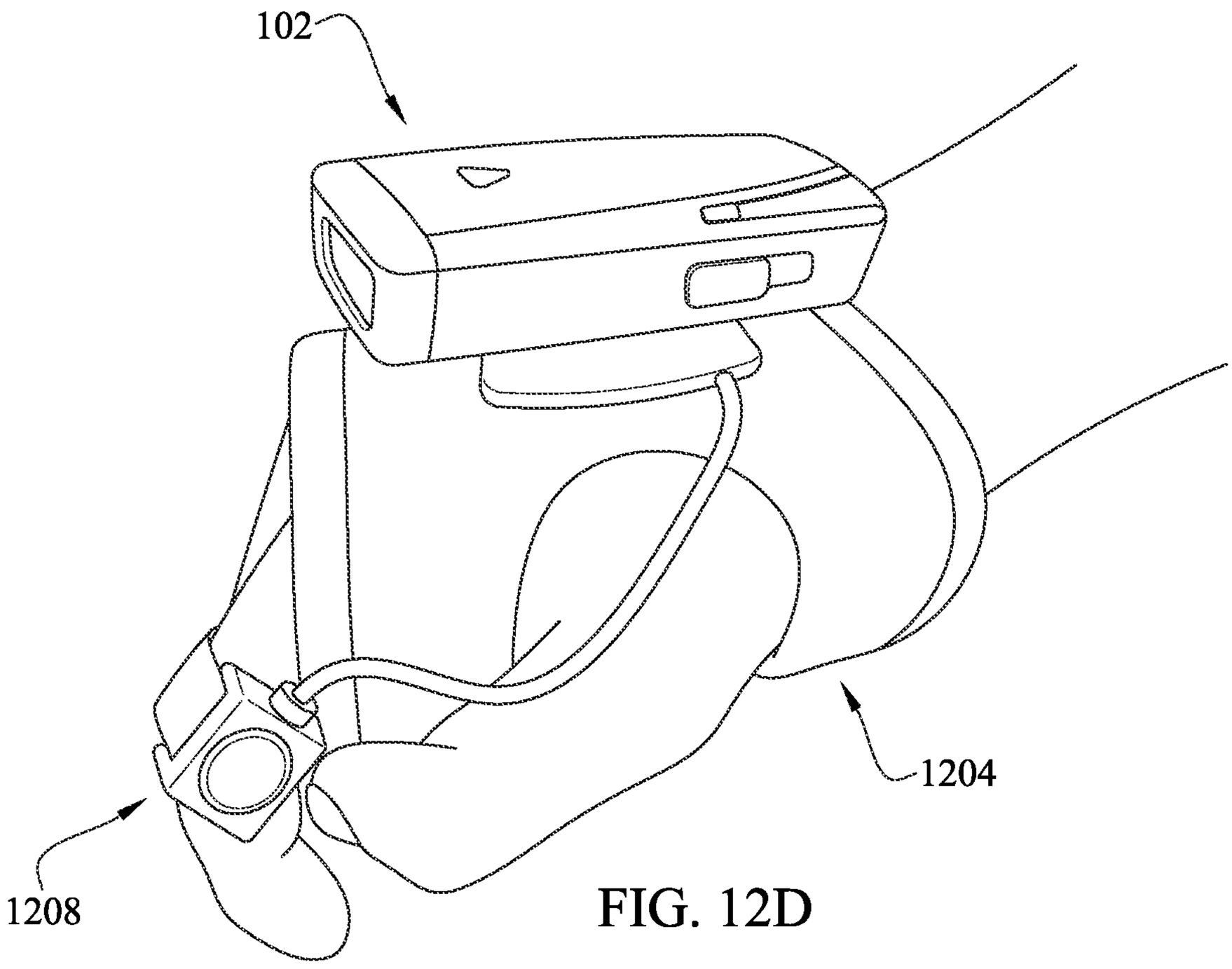

FIG. 12D

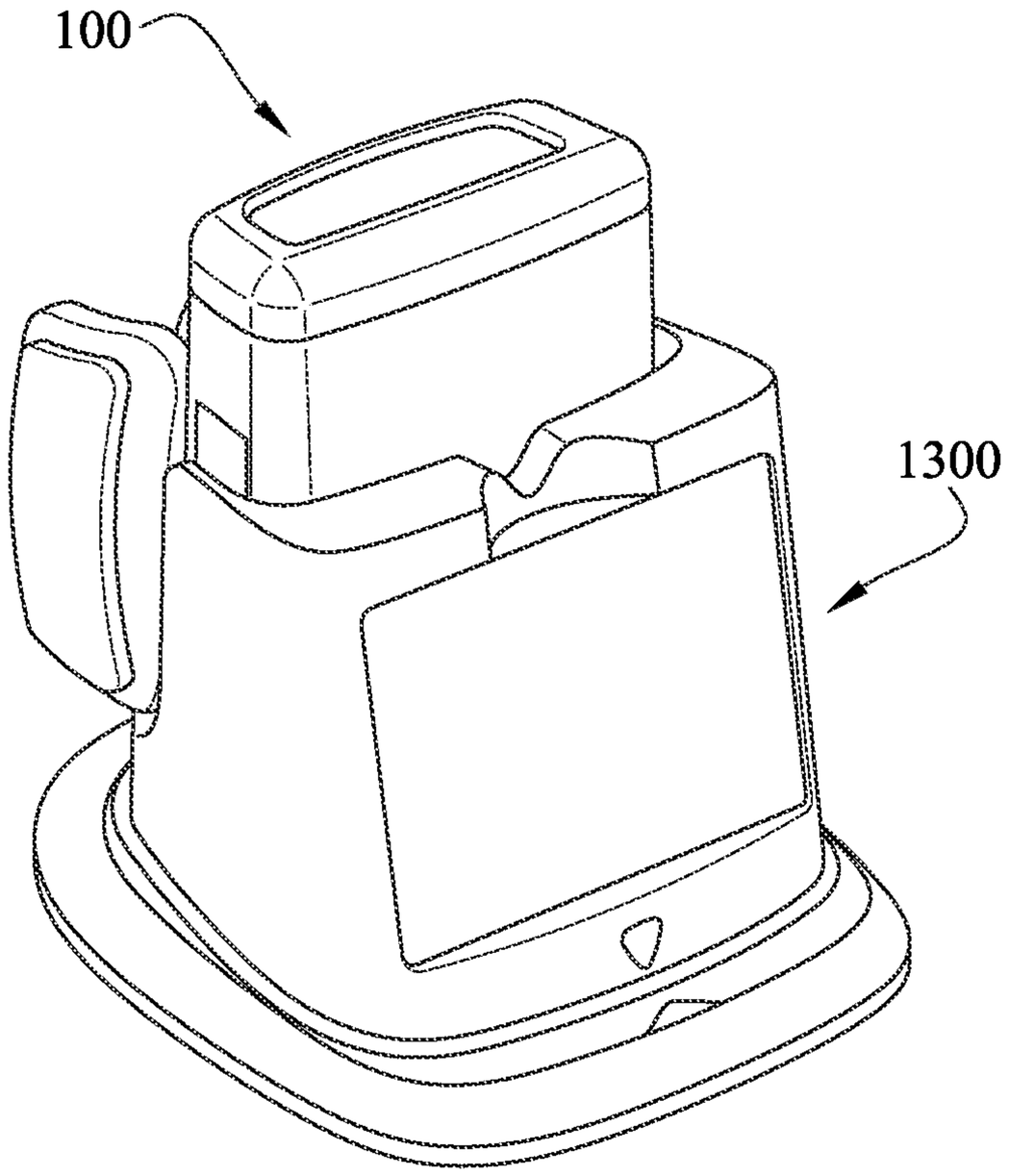

FIG. 13A

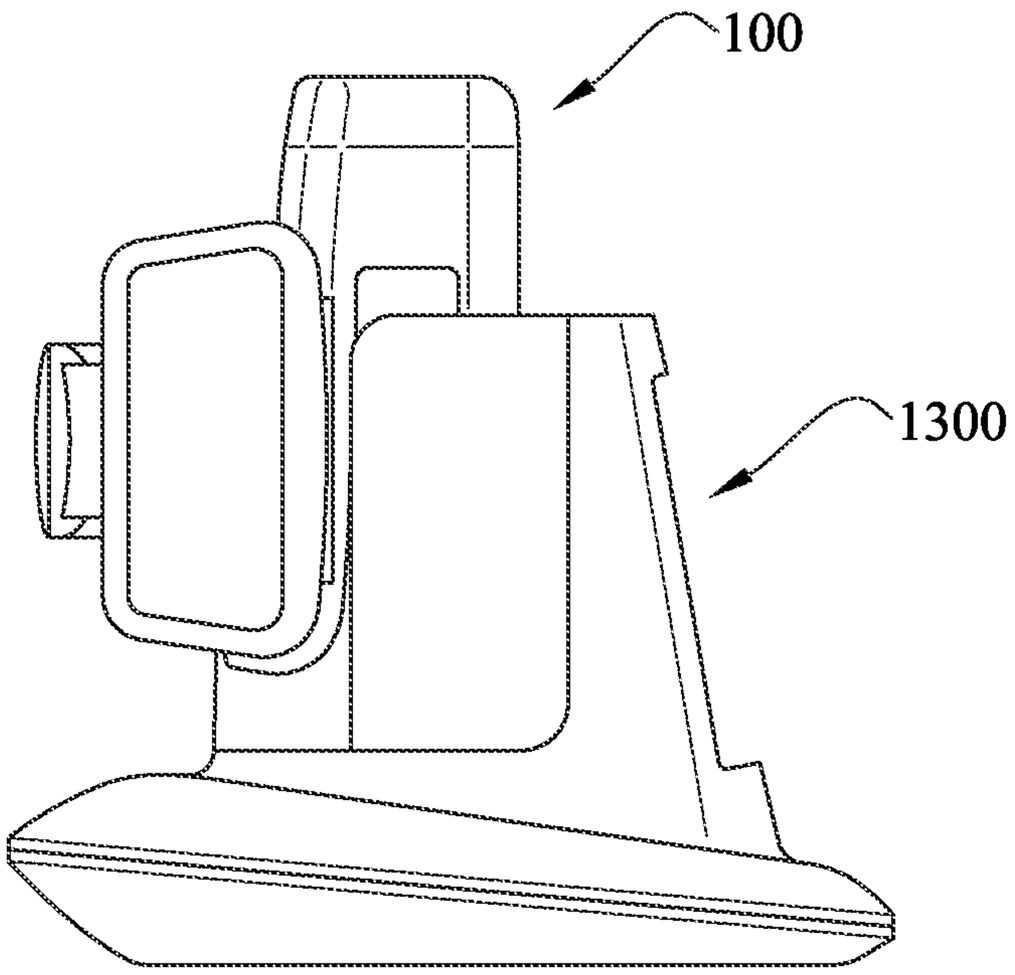

FIG. 13B

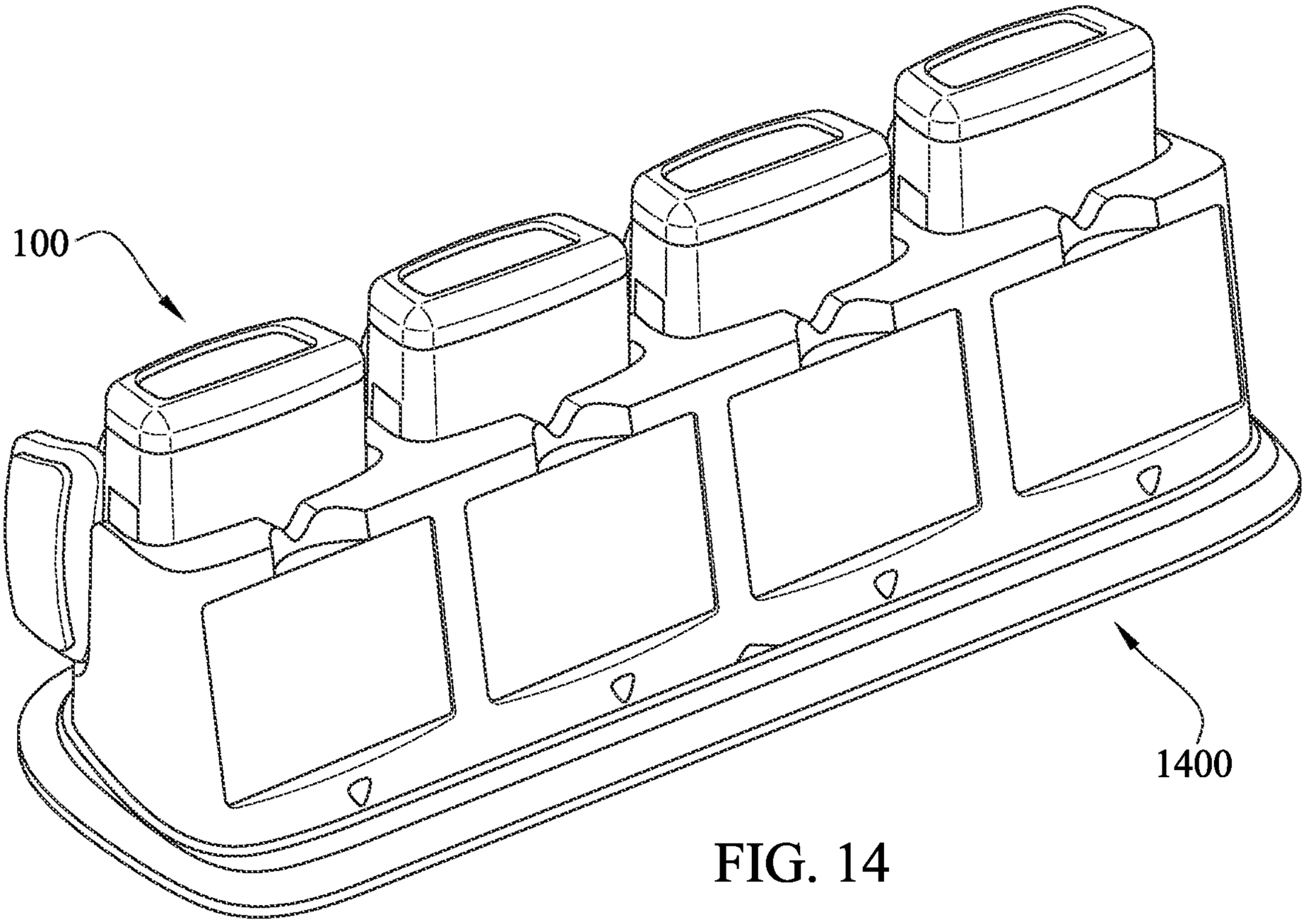

FIG. 14

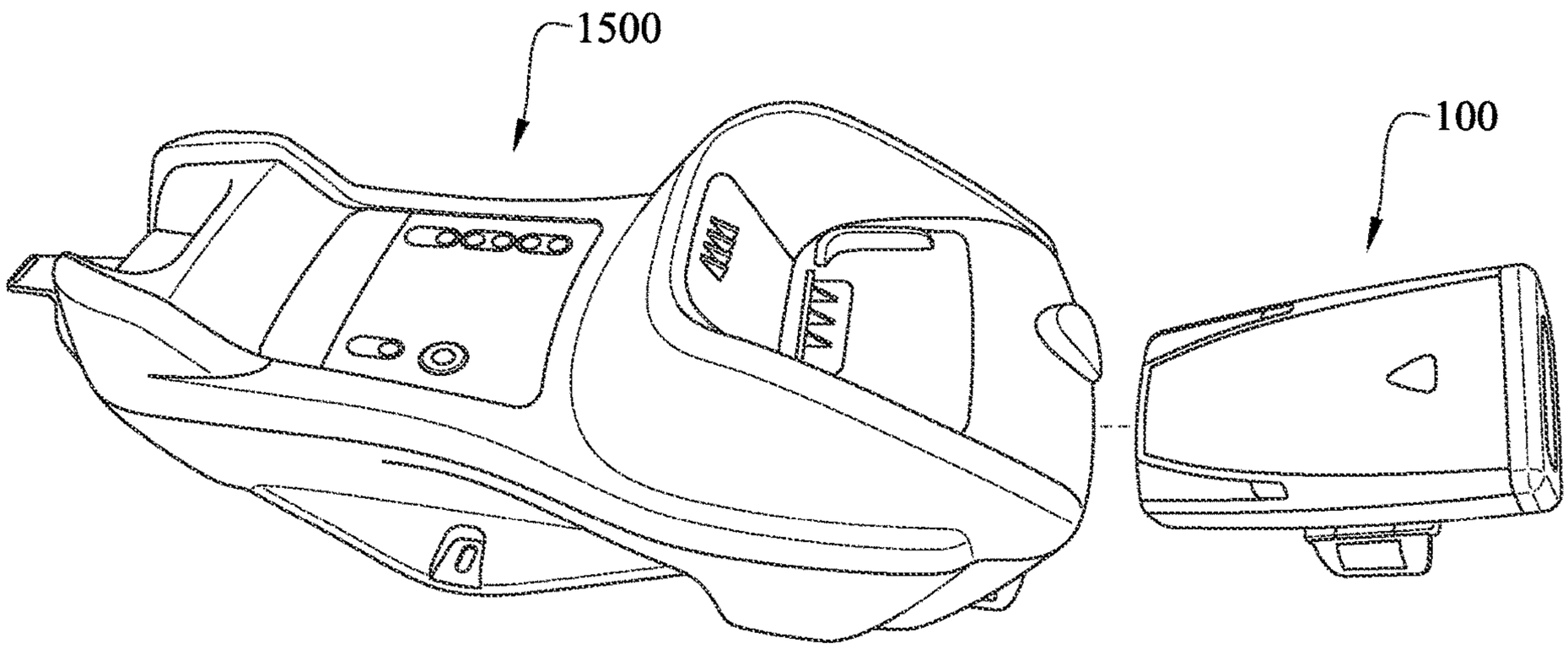

FIG. 15A

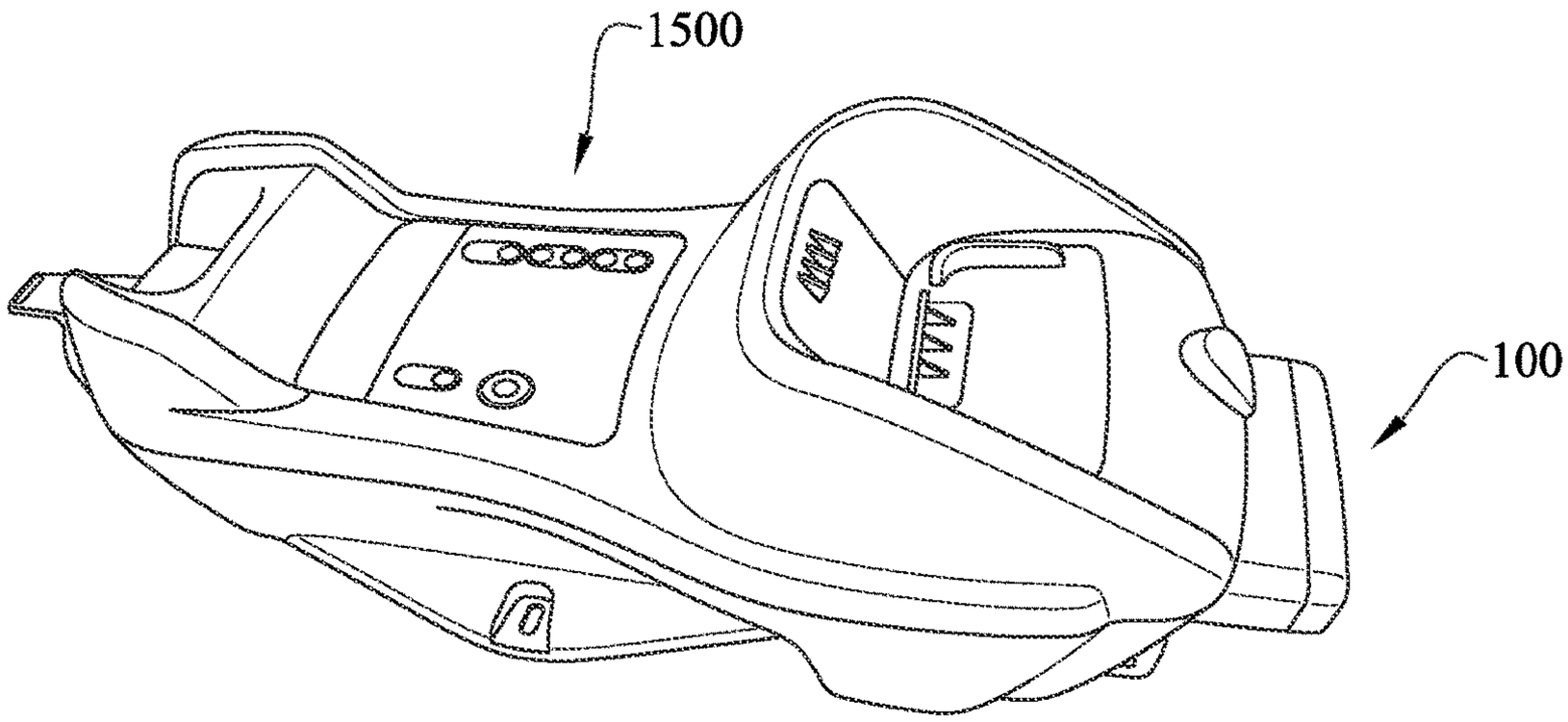

FIG. 15B

FINGER WEARABLE SCANNER AND RELATED METHODS

CROSS REFERENCE TO RELATED APPLICATION

This application claims the benefit of U.S. Provisional Application No. 62/810,899, filed Feb. 26, 2019, and entitled "Finger Wearable Scanner and Related Methods," the disclosure of which is hereby incorporated in its entirety by this reference.

TECHNICAL FIELD

The disclosure relates generally to the field of data readers, such as barcode readers. More specifically, the disclosure relates to wearable data readers.

BACKGROUND

Data readers (e.g., barcode readers) are used in a variety of ways to recognize one or more identifiers (e.g., a one-dimensional barcode, two-dimensional barcode, text, images, packaging, watermark, etc.) associated with an object. Barcode readers are physically configured for different uses. For example, checkout counters at points-of-sale have barcode readers that are configured to be used to scan barcodes on consumer goods, and are often fixed position and/or are handheld. For performing order picking, barcode scanners have historically been handheld in the shape of a gun with a handgrip and trigger for activating the scanner. More recently, barcode scanners have been wearable by a user to ease order picking processes, such as performing order picking in warehouses or retail stores, for example. However, conventional wearable barcode readers are bulky as the readers tend to be inches thick, which often results in the readers getting caught on edges of boxes, shelves, or otherwise. As a result of the thickness and configuration of wearable barcode scanners, the scanners result in a physical hassle to the user, which ultimately results in inefficiency of productivity. Additionally, the weight and cabling of conventional wearable barcode readers are prohibitively cumbersome to the user. As a result of the physical configurations of conventional wearable barcode readers, users tend to refrain from using the barcode readers for extended periods of time due to physical challenges and inefficiencies resulting therefrom.

BRIEF SUMMARY

Embodiments of the disclosure include a scanner unit and a trigger assembly. The scanner unit includes an upper enclosure and a lower enclosure that are detachable from each other; and a scan engine mount assembly and a scan engine mounted thereto that is configured to read and decode an identifier on an object, wherein the scan engine assembly includes mounting locations that engage with fasteners to mount be mounted to both the upper enclosure and the lower enclosure. The trigger assembly is configured to be attached to and detached from the wearable scanner, and to be worn by a body part of a user. The trigger assembly includes a trigger switch to control operational functions of the wearable scanner responsive to an input from the user.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGS. **1**A-**1**G are various views of a wearable scanner according to an embodiment of the disclosure.

FIGS. **2**A and **2**B are various side views of the wearable scanner.

FIGS. **3**A-**3**E are various views of the internal connections of the components of the scanner unit with respect to its enclosures.

FIGS. **4**A-**4**H are various views of the trigger assembly according to an embodiment of the disclosure.

FIG. **5** is an exploded view of the trigger assembly according to an embodiment of the disclosure.

FIGS. **6**A-**6**D are various views of the bottom enclosure of the scanner unit.

FIGS. **7**A-**7**R are various views of the trigger assembly.

FIGS. **8**A and **8**B are various views of the bottom enclosure of the scanner unit.

FIGS. **9**A and **9**B are various views of the trigger assembly.

FIGS. **10**A and **10**B are various views of the wearable scanner.

FIGS. **11**A and **11**B show the scanner unit **102** being removed from the trigger assembly **104** worn on the user's finger

FIGS. **12**A-**12**D show the similar mounts being integrated into gloves that may be worn with the scanner unit attached to a mount on the wrist and a trigger button worn on a finger.

FIGS. **13**A and **13**B show a single charging station configured to receive a single wearable scanner.

FIG. **14** shows a charging station configured to receive multiple wearable scanners for simultaneous charging.

FIGS. **15**A and **15**B show a charging station that is configured as a dual-purpose charging station that charges both the wearable scanner as well as another device such as a handheld scanner.

DETAILED DESCRIPTION

The illustrations included herewith are not meant to be actual views of any particular systems, memory device, architecture, or process, but are merely idealized representations that are employed to describe embodiments herein. Elements and features common between figures may retain the same numerical designation except that, for ease of following the description, for the most part, reference numerals begin with the number of the drawing on which the elements are introduced or most fully described. In addition, the elements illustrated in the figures are schematic in nature, and many details regarding the physical layout and construction of a memory array and/or all steps necessary to access data may not be described as they would be understood by those of ordinary skill in the art.

As used herein, the singular forms "a," "an," and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise.

As used herein, "and/or" includes any and all combinations of one or more of the associated listed items.

As used herein, the term "configured" refers to a size, shape, material composition, and arrangement of one or more of at least one structure and at least one apparatus facilitating operation of one or more of the structure and the apparatus in a pre-determined way.

As used herein, the phrases "coupled to" or "coupled with" refer to structures operatively connected with each other, such as connected through a direct connection or through an indirect connection (e.g., via another structure).

FIGS. **1**A-**1**G are various views of a wearable scanner **100** having a scanner unit **102** operably coupled with a trigger assembly **104** according to an embodiment of the disclosure. In particular, FIG. **1**A is a top perspective view of the

wearable scanner, FIG. **1**B is a bottom perspective view of the wearable scanner **100**, FIG. **1**C is a front view of the wearable scanner **100**, FIG. **1**D is a back view of the wearable scanner **100**, and FIG. **1**E is a side view of the wearable scanner **100**. FIG. **1**F is a perspective view of the trigger assembly **104** with the scanner unit **102** detached. FIG. **1**G is a perspective view of the scanner unit **102** with the trigger assembly **104** detached.

The wearable scanner **100** includes a scanner unit **102** operably coupled with a trigger assembly **104**. The scanner unit **102** may include one or more scanning elements such a scan engine including one or more imagers, light sources, processors, memory, and other components configured to read and decode an identifier (e.g., 1D codes, 2D codes, watermarks, packaging, text, etc.) according to various symbologies and image recognition techniques. The trigger assembly **104** may include a strap and other ergonomic features configured to attach the wearable scanner **100** to a body part of a user (e.g., one or more fingers) such that the scanner unit **102** may rest on the top of the fingers and enable the user to activate a trigger switch **106** (e.g., via a thumb) on the side of the trigger assembly **104** to control operational functions of the wearable scanner **100**. The trigger assembly **104** may be configured to attach to the underside of the scanner unit **102** to establish the appropriate electrical connections therebetween and provide a support for the scanner unit **102** when worn by the user. The scanner unit **102** and the trigger assembly **104** may be detached from each other as shown particularly in FIGS. **1**F and **1**G. As shown, the underside of the scanner unit **102** may include a recessed portion (e.g., in the central region) that slides across a protruding portion on the top side trigger assembly **104** to mate with grooves or other connecting regions that secure the scanner unit **102** to the trigger assembly **104**. Electrical contacts (e.g., connector spring contact **604** described further below) may be located within the recessed portion of the scanner unit **102** to align with corresponding contacts (e.g., connector springs **504** described further below) located in the trigger assembly **104** to provide power and/or communication therebetween when attached. The recessed portion of the scanner unit **102** may also include cavities (e.g., depressions, slots, etc.) that engage with the spring latch (see element **402** in FIGS. **4**A-**4**H) to provide a locking key that secures the scanner unit **102** with the trigger assembly **104** to avoid being accidently removed. Each end of the recessed portion may include such a cavity, which may enable the scanner unit to be flipped and slid across the by sliding across the face thereof until engaging with the locking key, in which the spring latch **402** may engage with a corresponding cavity at an end of the recessed portion of the scanner assembly **102** (see FIG. **1**G). Thus, the scanner unit **102** may be attachable with the trigger assembly **104** in either a right-hand or a left-hand configuration.

FIGS. **2**A and **2**B are various side views of the wearable scanner **100** showing placement of a power source, such as battery pack **206** which may be inserted into a slot **204** within the housing of the scanner unit **102** from the side. The slot **204** may be accessed by removing a battery latch **202** from the side of the scanner unit **102** to expose the internal slot **204** and connectors for the battery pack **206** to provide power to the scanner unit **102**. The battery pack **206** is inserted into the slot **204** and the battery pack **206** is held in position by the latch **202**. The battery pack **206** may be at least partially ejected by internal helical spring when the latch **202** is released.

As a result, the battery pack **206** may be located internal to the body of the scanner unit **102** and not mounted on an external side thereof. Doing so may enable the battery pack **206** to be removed and replaced easily while also keeping the overall size and weight of the wearable scanner **100** at a low level. The location of the battery pack **206** may be approximately the center of gravity for the wearable scanner **100** and close to the user's fingers. Gyro effect forces on the hand motion may be reduced by having the scanner center of gravity localized in the middle of the scanner **100** and closer to the hand fingers when the battery pack **206** is placed internally and centered.

Because the wearable scanner **100** may be mounted on the user's fingers for an extended time, the wearable scanner **100** may desirably be small and light weight to increase operator comfort during usage. The placement of the battery pack and the connections to the enclosure enable the heaviest component (i.e., the battery) to be located close to the fingers and centered in the enclosure volume.

FIGS. **3**A-**3**E are various views of the internal connections of the components of the scanner unit **102** with respect to its enclosures. The scanner unit **102** includes an upper enclosure **308** and a bottom enclosure **312** that may be detached from each other, and which house a scan engine mount assembly **302** (that includes the slot and connections for the battery pack and the scan engine **304**). As shown in FIGS. **3**A-**3**B, fasteners **306** (e.g., screws) may be used to mount the scan engine mount assembly **302** to the upper enclosure **308** of the housing of the scanner unit **102**. FIGS. **3**C-**3**E show fasteners **310** (e.g., screws) used to mount the scan engine mount assembly **302** to the bottom enclosure **312** of the housing of the scanner unit **102**. Thus, the scan engine mount assembly **302** may have mounting locations engage with the fasteners **306**, **310** to be attached directly with each of the upper disclosure **308** and the bottom enclosure **312**.

Thus, embodiments include the upper enclosure **308** and the bottom enclosure **312** fastened together using the scanning engine mount assembly **302** as the internal mount providing the link therebetween and connecting the two enclosures **308**, **312** together. Internal components are present between the upper enclosure **308** and the lower enclosure **312** for direct connection. In some embodiments using screws, the upper enclosure **308** has threaded inserts to fasten the scan engine mount assembly **302** to it by screws **306**. The scan engine mount assembly **302** has threaded inserts for fastening the bottom enclosure **312** by screws **310**. The assembly of the upper enclosure and scan engine is mounted to the bottom enclosure. The bottom enclosure is fastened to the scan engine threaded holes by screws.

FIGS. **4**A-**4**H are various views of the trigger assembly **104** according to an embodiment of the disclosure. The trigger assembly **104** includes a locking key including a spring latch **402** having a bottom portion **404** that engages with a strap ring **406**. The strap ring **406** may engage with the strap that is used to adjust the sizing and connection to the user's fingers and the finger rest. The scanner unit **102** may attach to the trigger assembly **104** by sliding across the face thereof until engaging with the locking key, in which the spring latch **402** engage with a corresponding cavity at an end of the recessed portion of the scanner assembly **102** (see FIG. **1**G). The locking key may be used for safety by preventing the scanner unit **102** from accidentally dislodging or otherwise being removed from the trigger assembly **104** when they are connected. Unlocking the scanner unit **102** may require at least two movements.

The strap ring **406** may be configured and oriented relative to the spring latch **402** to prevent the spring latch **402** from moving and unlatching from the scanner unit **102**

during normal usage. The strap ring **406** rotates inward for unlatching the trigger assembly **104** when removing the scanner unit **102** from trigger assembly **104**. The spring latch bottom tab **404** is used to stop (i.e., lock position) the movement of the spring latch **402** by interfering with the strap ring **406** when the strap ring **406** is rotated outward. The bottom tab **404** has no interference with the strap ring **406** is rotated inward which allows the spring latch **402** to be unlocked. The operator fingers may force the strap ring **406** to be rotated outward and preventing the spring latch **402** from unlocking during the normal operation. It will ensure the scanner unit **102** is locked during use because the fingers will provide the needed input to keep the spring latch **402** engaged in the scanner unit **102**.

FIGS. **4**C and **4**D show the spring latch **402** moving from a closed to an open position. In particular, the strap ring rib acts as stop for the spring latch **402** when the spring latch **402** is pushed down for release. The strap ring **406** position is shown rotated outward. FIGS. **4**E and **4**F show the strap ring rib rotating to allow the spring latch **402** downward movement for unlatching the trigger assembly **102** from the scanner unit **104**. The strap ring **406** position is shown rotated inward. FIG. **4**G shows the spring latch **102** being open. In this case, the strap ring **406** is rotated inward to allow the spring latch **402** to move downward and unengaged the spring latch **402** with bottom enclosure. FIG. **4**H shows the spring latch **402** being closed and engaged with the bottom enclosure. In this case, the strap ring **406** is pushed outward by the user fingers to prevent the spring latch **402** from moving downward.

FIG. **5** is an exploded view of the trigger assembly **104** according to an embodiment of the disclosure. The trigger assembly **104** further includes a trigger switch **502** operably coupled with contact springs **504** via a connector cable **508**. A rubber seal **506** may surround the contact springs **504**, and which may be located on a hinge plate **510** having arms **512**, an integrated spring **514**, and rotational pins **516**. These internal components may be housed within an upper enclosure **518** and a lower enclosure **520** also including guides **522**. The upper and lower enclosures **518**, **520** may be coupled together via fasteners (e.g., screws).

The wearable scanner trigger assembly **104** may have a sealed switch for IP67. The trigger assembly switch **502** may be a dome switch which is electrically activated. The electrical connection in the trigger assembly **104** may be sealed to IP67 when it is fully assembled while maintaining an overall height at a minimum. The wearable scanner with a removable trigger assembly **104** includes the trigger switch electrical connection through the flexible cable **508** where a connector spring contact **604** is mounted at the end of the flexible cable **508**. The contact connector springs **594** may engage with copper surfaces on the bottom enclosure of the scanner unit **502** to complete the electrical connection to the scanner printed circuit board (PCB). The trigger electrical connections may be sealed for IP67 during operation by a rubber seal **506** that is mounted with adhesive on the flexible cable **508** and around the connector spring contact body. The rubber seal **506** and connector spring **504** are elevated vertically to create pressure for the rubber seal ribs against the bottom enclosure and for the connector springs **504** against the copper contacts when the trigger assembly **104** at the final position in the scanner bottom enclosure by the hinge plate **510**. The rubber seal **506** and connector springs **504** retract downward when the trigger assembly **104** is pulled out of the scanner unit **102**. The end of the flexible cable **508** has the rubber seal **506** and the connector spring **504** which they are adhered to a hinge-plate upper surface. The hinge plate **510** allows them to move up and down when trigger assembly **104** is inserted or retracted from the scanner unit **102**. The hinge plate **510** moves up or down when the hinge plate arms **512** are pushed by the bottom scanner side ribs. The hinge plate arms **512** have ramps to move them up or down when they are engaged with the bottom scanner ribs front surface. The hinge plate **510** has an integrated spring **514** to maintain the rubber seal **506** and connector pushed downward when the trigger is outside the scanner bottom enclosure for protection and to avoid the connector springs **504** from scraping on the bottom enclosure surface of the scanner unit **102** during insertion.

The flexible cable switch end and the hinge plate assembly (including the contacts spring/flexible cable/rubber seal) are placed inside the trigger assembly bottom enclosure. The flexible cable switch end may be adhered to bottom enclosure vertical surface. The other end of the flexible cable is the hinge plate **510** which hinge plate rotational pins **516** are placed in the trigger bottom enclosure as rotational half cylinders. The hinge plate pins **516** and the hinge plate **510** are captured by the upper enclosure surface of the trigger assembly. The hinge plate **510** is pushed downward by an integrated spring that pushes against the upper enclosure surface. The hinge plate has arms with ramps that are in line of the bottom enclosure side guides.

FIGS. **6**A-**6**D are various views of the bottom enclosure **312** of the scanner unit **102**. The bottom enclosure **312** includes copper contacts sheet metal **604**, **606** which they are insert molded. The copper contacts **604**, **606** are used to provide the electrical contacts between the main PCB and the trigger assembly contact connector. The bottom scanner enclosure has ribs **602** to guide the trigger assembly and to provide a ramp for moving the hinge plate arms (hinge plate assembly) upward.

FIGS. **7**A-**7**R are various views of the trigger assembly **104** when assembled showing placement and external exposure of the hinge plate arms **512**, the contact springs **504**, and rubber seal **506**. In particular, FIGS. **7**C-**7**I show the hinge plate **510** moved into a downward position relative to the enclosure surfaces such that the contact springs **504** and rubber seal **506** are also moved downward creating an open circuit and/or preparing for removal from the scanner unit **102**. FIGS. **7**J-**7**R show the hinge plate **510** moved into an upward position relative to the enclosure surfaces such that the contact springs **504** and rubber seal **506** are also moved downward creating a closed circuit after insertion of the scanner unit **102**.

In some embodiments, the wearable scanner **100** may be configured such that the trigger assembly **104** and the scanner unit **102** may slide from left to right or from right to left through guides and locking mechanism to hold the scanner in place. As a result, the scanner unit **102** can be removed from the trigger assembly **104** without removing the trigger assembly from the hand. In addition, the wearable scanner **100** may enable the trigger button **106** to be functioning and accessible to the user (e.g., thumb) when the wearable scanner **100** is mounted on the left or right hand.

FIGS. **8**A and **8**B are various views of the bottom enclosure of the scanner unit **104** that will complementarily couple with the trigger assembly **104** of FIGS. **9**A and **9**B. The trigger assembly **104** may be removable from the scanner unit **102** to orient the trigger assembly button **106** on the left or right of the front **120** of the scanner unit **102** depending on the user preference as shown in FIGS. **10**A and **10**B. The scanner unit **102** may be removable from the trigger assembly **104** without removing the trigger assembly

from hand which the scanner can scan bar codes without the use of trigger by using autosense functionality.

The scanner unit **102** on the bottom side has guides **602** on both sides of a recessed surface on the bottom enclosure. The trigger assembly **104** enclosure has grooves on both side for the trigger assembly to slide into the scanner guides **602**. The trigger assembly **104** is placed into position by stops on the guides **602** and locked into the scanner by the spring latch **402** that can couple with recessed features **610** on either side. The trigger assembly **102** can be inserted from the left or right sides of the scanner.

In some embodiments, the scanner unit **102** may be removed from the trigger assembly **194** while the trigger assembly **104** is mounted into the user's fingers and may be mounted on other mounts having similar mating features. For example, FIGS. **11**A and **11**B show the scanner unit **102** being removed from the trigger assembly **104** worn on the user's finger (FIG. **11**A) and then being placed on a belt clip mount **1104** (FIG. **11**B).

FIGS. **12**A-**12**D show the similar mounts being integrated into gloves that may be worn with the scanner unit **102** attached to a trigger assembly mount on the wrist (or top of the hand) and a separate trigger button **1208** being worn on a finger. The trigger assembly mount **1204** may be configured to be attached and detached from the scanner unit **102** as discussed above, including locking mechanisms and the ability to be attached in either a right-hand configuration or a left-hand configuration. The trigger button **1208** may be pressed by the user's thumb. The trigger button **1208** and the trigger mount assembly **1204** may communicate with each other via a wired connection (as shown) or a wireless connection in some embodiments. The trigger mount assembly **1204** may then route any control signals or other communication information to the scanner unit **102**. For example, FIGS. **12**A, **12**B show the trigger mount assembly **1204** being incorporated into a glove with cutout finger holes. FIGS. **12**C, **12**D show the trigger mount assembly **1204** being incorporated into a hand strap in which the strap connects to the back of the hand and around the thumb without individual finger holes. The scanner unit **102**, therefore, may rest on top of the user's hand. Other embodiments are also contemplated in which the trigger assembly mount **1204** may be integrated into other types of wearable items and/or stands.

Embodiments of the disclosure may further include charging stations. For example, FIGS. **13**A and **13**B show a single charging station **1300** configured to receive a single wearable scanner **100**. FIG. **14** shows a charging station **1400** configured to receive multiple wearable scanners **100** for simultaneous charging. FIGS. **15**A and **15**B show a charging station **1500** that is configured as a dual-purpose charging station that charges both the wearable scanner **100** as well as another device such as a handheld scanner. In each case, the wearable scanner **100** may be received into a docking area (e.g., cradle) that establishes electrical contacts for wired charging of the battery pack therein. In some embodiments, the docking area may facilitate alignment of wireless charging coils to perform wireless power transfer (e.g., inductive charging). Data transfer may also be performed with the charging stations (e.g., wired and/or wirelessly). Wearable scanners **100** may be inserted into the docking area with both the scanner unit **102** and the trigger assembly **104** attached, the scanner unit **102** alone, or by removal of the battery pack in various embodiments thereof.

While the disclosure is susceptible to various modifications and alternative forms, specific embodiments have been shown by way of example in the drawings and have been described in detail herein. However, the disclosure is not limited to the particular forms disclosed. Rather, the disclosure is to cover all modifications, equivalents, and alternatives falling within the scope of the following appended claims and their legal equivalents.

What is claimed is:

1. A wearable scanner comprising:

a scanner unit including:

an upper enclosure and a lower enclosure that are detachable from each other; and

a scan engine mount assembly and a scan engine mounted thereto that is configured to read and decode an identifier on an object, wherein the scan engine assembly includes mounting locations that engage with fasteners to mount be mounted to both the upper enclosure and the lower enclosure; and

a trigger assembly configured to be attached to and detached from the wearable scanner, and to be worn by a body part of a user, the trigger assembly including:

a trigger switch to control operational functions of the wearable scanner responsive to an input from the user; and

a strap ring that contacts the spring latch, wherein the strap ring is rotated inward to move the spring latch downward and disengage the spring latch with the corresponding cavity in the bottom enclosure when detaching the scanner unit from the trigger assembly.

2. The wearable scanner of claim **1**, wherein the scan engine includes one or more imagers, light sources, processors, or memory, or any combination thereof.

3. The wearable scanner of claim **1**, wherein a top portion of the trigger assembly is configured to attach to the underside of the scanner unit to establish electrical connections therebetween and provide a support for the scanner unit when worn by the user.

4. The wearable scanner of claim **3**, wherein the scanner unit includes a removable side latch and an internal slot within which a battery pack is inserted.

5. The wearable scanner of claim **3**, wherein the bottom enclosure of the scanner unit includes a recessed portion that mates with a corresponding protruding portion of the trigger assembly to attached thereto.

6. The wearable scanner of claim **5**, wherein the recessed portion includes a first cavity proximate a first end thereof to engage with the spring latch on the trigger assembly.

7. The wearable scanner of claim **6**, wherein the recessed portion includes a second cavity proximate a second end thereof to engage with the spring latch on the trigger assembly to enable the scanner unit to be attachable in either a right hand or a left hand configuration.

8. The wearable scanner of claim **1**, wherein the trigger assembly is configured to be activated by a thumb when worn by the user.

9. The wearable scanner of claim **1**, wherein the trigger assembly is configured to be worn by one or more fingers of the user.

10. The wearable scanner of claim **1**, wherein the trigger assembly is incorporated within a glove to be worn on the hand of a user.

11. The wearable scanner of claim **1**, wherein the trigger assembly is incorporated within a glove to be worn on the hand of a user.

12. A wearable scanner comprising:

a scanner unit including:

an upper enclosure and a lower enclosure that are detachable from each other; and

a scan engine mount assembly and a scan engine mounted thereto that is configured to read and decode an identifier on an object, wherein the scan engine assembly includes mounting location that engage with fasteners to mount be mounted to both the upper enclosure and the lower enclosure; and

a trigger assembly configured to be attached to and detached from the wearable scanner, and to be worn by a body part of a user, the trigger assembly including:

a trigger switch to control operational functions of the wearable scanner responsive to an input from the user; and

a strap ring that contacts a spring latch, wherein the strap ring is pushed outward to engage the spring latch with the corresponding cavity in the bottom enclosure and prevent the spring latch from moving downward when attaching the scanner unit with the trigger assembly.

13. The wearable scanner of claim **1**, wherein the trigger switch of the trigger assembly is operably coupled with contact springs via a connector cable.

14. A wearable scanner comprising:

a scanner unit including:

an upper enclosure and a lower enclosure that are detachable from each other; and

a scan engine mount assembly and a scan engine mounted thereto that is configured to read and decode an identifier on an object, wherein the scan engine assembly includes mounting location that engage with fasteners to mount be mounted to both the upper enclosure and the lower enclosure; and

a trigger assembly configured to be attached to and detached from the wearable scanner, and to be worn by a body part of a user, the trigger assembly including:

a trigger switch to control operational functions of the wearable scanner responsive to an input from the user; and

a hinge plate having arms, a connector spring, and rotational pins.

15. The wearable scanner of claim **14**, wherein the trigger assembly further comprises a seal, wherein the connector spring is elevated vertically by the hinge plate to create pressure for the seal against the bottom enclosure and for the connector spring against electrical contacts when the trigger assembly is at a final position in the scanner bottom enclosure.

16. The wearable scanner of claim **15**, wherein the seal and the connector spring retract downward when the trigger assembly detached from of the scanner unit.

17. The wearable scanner of claim **16**, wherein the hinge plate moves up or down when the hinge plate arms are pushed by side ribs on the bottom enclosure of the scanner unit.

18. The wearable scanner of claim **17**, wherein the hinge plate arms have ramps configured to move up or down when engaged with a front surface of the side ribs on the bottom enclosure of the scanner unit.

19. The wearable scanner of claim **17**, wherein the hinge plate includes an integrated spring to maintain the seal and the connectors pushed downward when the trigger assembly is moving along an outside portion the bottom enclosure of the scanner unit to avoid the connectors from scraping on the bottom enclosure surface of the scanner unit during insertion.

20. The wearable scanner of claim **14**, wherein the trigger assembly includes:

a trigger assembly mount that engages with the scanner unit; and

a trigger button that includes the trigger switch, wherein the trigger button communicates with the trigger assembly mount via at least one of a wired or wireless connection.

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